µC²SE

electronic control

CAREL

ENG User manual

Technology & Evolution

IMPORTANT WARNINGS

CAREL bases the development of its products on several years' experience in the HVAC field, on continuous investment in technological innovation of the product, on rigorous quality procedures and processes with in-circuit and function tests on 100% of its production, on the most innovative production technologies available on the market. CAREL and its branch offices/affiliates do not guarantee, in any case, that all the aspects of the product and the software included in the product will respond to the demands of the final application, even if the product is built according to state-of-the-art techniques. The client (builder, developer or installer of the final equipment) assumes every responsibility and risk relating to the configuration of the product in order to reach the expected results in relation to the specific final installation and/or equipment. CAREL in this case, through specific agreements, can intervene as consultant for the positive result of the final start-up machine/application, but in no case can it be held responsible for the positive working of the final equipment/apparatus.
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Each CAREL product, in relation to its advanced technological level, needs a phase of definition / configuration / programming / commissioning so that it can function at its best for the specific application. The lack of such phase of study, as indicated in the manual, can cause the final product to malfunction of which CAREL can not be held responsible.
Only qualified personnel can install or carry out technical assistance interventions on the product.
The final client must use the product only in the manner described in the documentation related to the product itself.
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- To avoid getting the electrical circuits wet. Rain, humidity and all types of liquids or condensation contain corrosive mineral substances that can damage the electrical circuits. In any case, the product should be used and stored in environments that respect the range of temperature and humidity specified in the manual.
- Do not install the device in a particularly hot environment. Temperatures that are too high can shorten the duration of the electronic devices, damaging them and distorting or melting the parts in plastic. In any case, the product should be used and stored in environments that respect the range of temperature and humidity specified in the manual.
- Do not try to open the device in any way different than that indicated in the manual.
- Do not drop, hit or shake the device, because the internal circuits and mechanisms could suffer irreparable damage.
- Do not use corrosive chemical products, aggressive solvents or detergents to clean the device.
- Do not use the product in application environments different than those specified in the technical manual.

All the above reported suggestions are valid also for the control, serial unit, programming key or nevertheless for any other accessory in the product portfolio of CAREL.
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Disposal of the product

In reference to European Community directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

1. we cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
2. the public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment.
3. the equipment may contain hazardous substances: the improper use or incorrect disposal of such may have negative effects on human health and on the environment;
4. the symbol (crossed-out wheeled bin) shown on the product or on the packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
5. in the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

Content

1. INTRODUCTION 7

1.1 General description 7
1.2 User interface 7

2. CONNECTIONS 9

2.1 General diagram 9
2.2 Network layout 9

3. APPLICATIONS 10

3.1 Air/air unit 10
3.2 AIR/AIR heat pump 11
3.3 AIR/WATER chiller 13
3.4 AIR/WATER heat pump 14
3.5 WATER/WATER chiller 16
3.6 WATER/WATER heat pump with reversal on gas circuit 17
3.7 WATER/WATER heat pump with reversal on water circuit 19
3.8 Air-cooled condensing unit without reverse cycle 20
3.9 Reverse-cycle air-cooled condensing unit 21
3.10 Water-cooled condensing unit without reverse cycle 22
3.11 Reverse-cycle water-cooled condensing unit 23
3.12 Roof Top units 24

4. PARAMETERS 25

4.1 General parameters 25
4.2 Menu structure 25
4.3 Parameter tables 26

5. DESCRIPTION OF THE PARAMETERS 35

6. TABLE OF ALARMS 58

7. CONNECTIONS, ACCESSORIES AND OPTIONS 62

7.1 Connection diagram 62
7.2 Expansion card 63
7.3 EVD4*: Electronic expansion valve driver 63
7.4 Fan speed control board (code MCHRTF*) 64
7.5 Fan ON/OFF control board (code CONVONOFF0) 64
7.6 PWM to 0 to 10Vdc (or 4 to 20 mA)conversion board for fans (code CONV0/10A0) 64
7.7 Minimum and maximum fan speed calculation 64
7.8 Programming key (code PSOPZKEYA0) 65
7.9 RS485 serial options 66
7.10 Terminals 66

8. DIMENSIONS 67

9. CODES 69

10. TECHNICAL SPECIFICATIONS AND SOFTWARE UPDATES 69

10.1 Technical specifications 69
10.2 Software updates 70

1. INTRODUCTION

1.1 General description

The μC²SE is a new compact CAREL electronic controller, the same size as a normal thermostat, for the complete management of chillers and heat pumps: it can control air-air, air-water, water-water and condensing units.

1.1.1 Main functions

- control of the water inlet and evaporator outlet temperature;
- defrost management by time and/or by temperature or pressure;
- fan speed control;
- complete alarm management;
- connection to serial line for supervision/telemaintenance;
- elimination of the expansion vessel.

- Driver function
- Management of electronic expansion valves.

1.1.2 Controlled devices

- compressor;
- condenser fans;
- reversing valve;
- water pumps for evaporator and/or condenser, and outlet fan (air-air);
- antifreeze heater;
- alarm signal device.

1.1.3 Programming

CAREL offers the possibility to configure all the unit parameters not only from the keypad on the front panel, but also using:

- a hardware key;
- a serial line.

1.2 User interface

1.2.1 Display

The display features 3 digits, with the display of the decimal point between -99.9 and 99.9. Outside of this range of measurement, the value is automatically displayed without the decimal (even if internally the unit still operates considering the decimal part).
In normal operation, the value displayed corresponds to the temperature read by probe B1, that is, the evaporator water inlet temperature (for water chillers) or the ambient air temperature for direct expansion units.
Fig. 1.a show the symbols present on the display and on the keypad and their meanings.

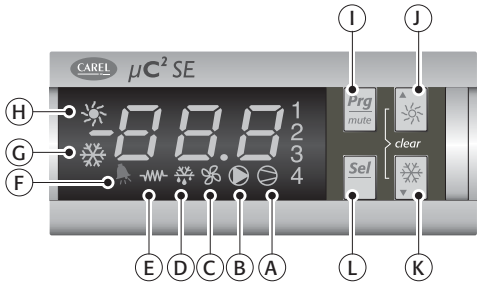


Fig. 1.a

1.2.2 Symbols on the display

Display with 3 green digits (plus sign and decimal point), amber symbols and red alarm symbols.

symbol	colour	meaning		reference refrigerant circuit
		with LED ON	with LED flashing	
1; 2	amber	compressor 1 and/or 2 ON	start up request	1
1; 3	amber	compressor 1 and/or 3 ON	start up request	2
A	amber	at least one compressor ON		1/2
B	amber	pump/air outlet fan ON	start up request	1/2
C	amber	condenser fan ON		1/2
D	amber	defrost active	defrost request	1/2
E	amber	heater ON		1/2
F	red	alarm active		1/2
G	amber	heat pump mode (P6=0)	heat pump mode request (P6=0)	1/2
H	amber	chiller mode (P6=0)	chiller mode request (P6=0)	1/2

Table 1.a

1.2.3 Functions associated with the buttons

button	unit status	button press
I	Loading default values	press at power ON
	Go up a sub-group inside the programming area, until exiting (saving changes to EEPROM)	press once
	In the event of alarms, mute the buzzer (if present) and deactivate the alarm relay	press once
L	Access the direct parameters	press for 5 s
	Select item inside the programming area and display value of direct parameters/confirm the changes to the parameters	press once
I + L	Program parameters afters entering password	press for 5 s
J	Select top item inside the programming area	press once or press and hold
	Increase value	press once or press and hold
	Switch from standby to chiller mode (P6=0) and vice versa	press for 5 s
	Provides immediate access to the condenser and evaporator pressure and temperature probes and DTE, DTC1-2	press once
K	Select bottom item inside the programming area	press once or press and hold
	Decrease value	press once or press and hold
	Switch from standby to heat pump mode (P6=0) and vice versa	press for 5 s
	Provides immediate access to the condenser and evaporator pressure and temperature probes and DTE, DTC1-2	press once
J + K	Manual alarm reset	press for 5 s
	Immediately reset the hour counter (inside the programming area)	press for 5 s
L + J	Force manual defrost on both circuits	press for 5 s

Table 1.b

1.2.4 Programming and saving the parameters

1. press "Prg/mute" and "Sel" for 5 seconds;
2. the heating and cooling symbol and the figure "00" are displayed;
3. use "▲" and "▼" to set the password (page 25) and confirm by pressing "Sel";
4. use "▲" and "▼" to select the parameter menu (S-P) or levels (L-P) and then press "Sel";
5. use "▲" and "▼" to select the parameter group and then press "Sel";
6. use "▲" and "▼" to select the parameter and then press "Sel";
7. after making the changes to the parameter, press "Sel" to confirm or "Prg/mute" to cancel the changes;
8. press "Prg/mute" to return to the previous menu;
9. to save the modifications, press "Prg/mute" repeatedly until reaching the main menu.

Note:

a. the parameters that have been modified without being confirmed using the "Sel" button return to the previous value;
b. if no operations are performed on the keypad for 60 seconds, the controller exits the parameter modification menu by timeout and the changes are cancelled.

1.2.5. Keypad

The keypad is used to set the unit operating values (see Parameters/alarms - Keypad combinations)

2. CONNECTIONS

2.1 General diagram

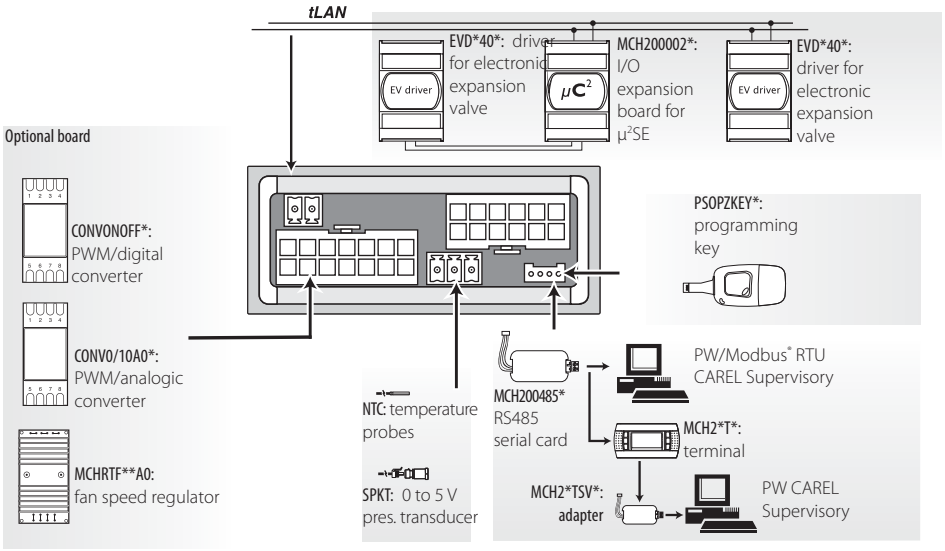


Fig. 2.a

2.2 Network layout

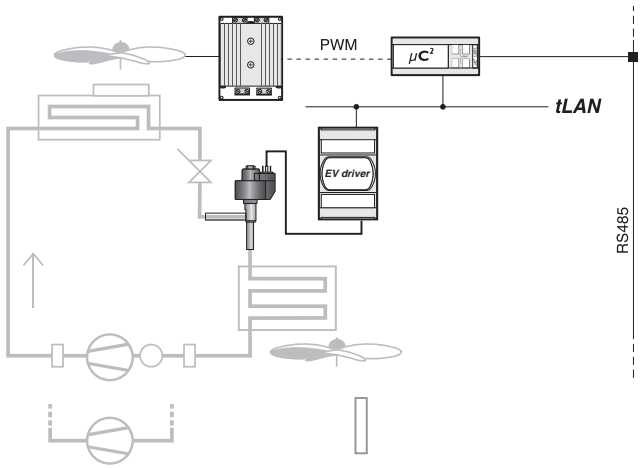


Fig. 2.b

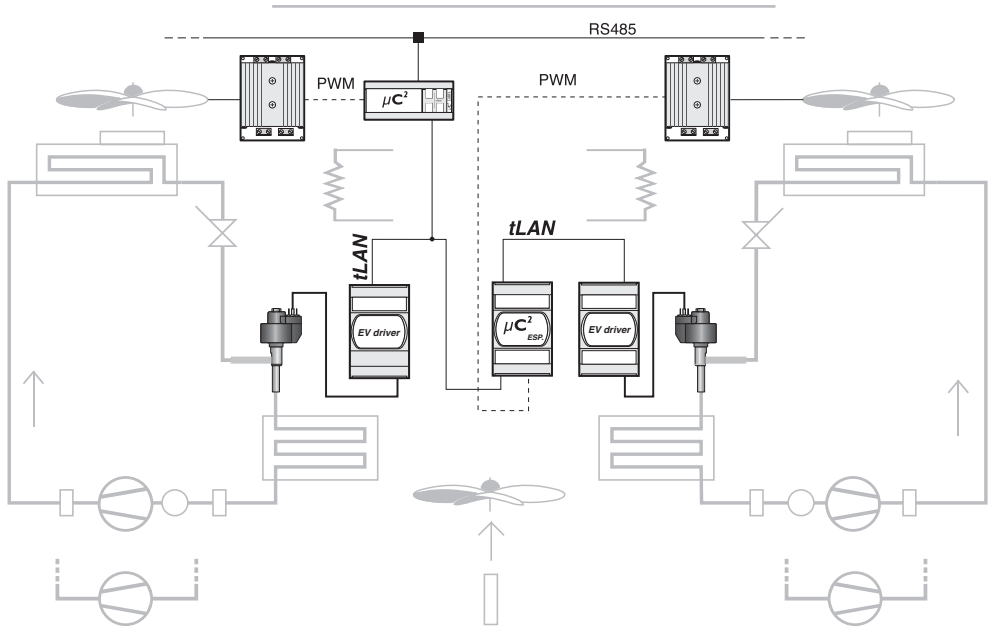


Fig. 2.c

3. APPLICATIONS

3.1 Air/air unit

3.1.1 Single circuit

Key:

1	condernser fan overload
2	fan
3	condenser probe
4	supply probe
5	electrical heater
6	evaporator
7	supply fan overload
8	supply fan
9	compressor 1
10	high pressure
11	compressor overload
12	low pressure
13	ambient probe
14	compressor 2

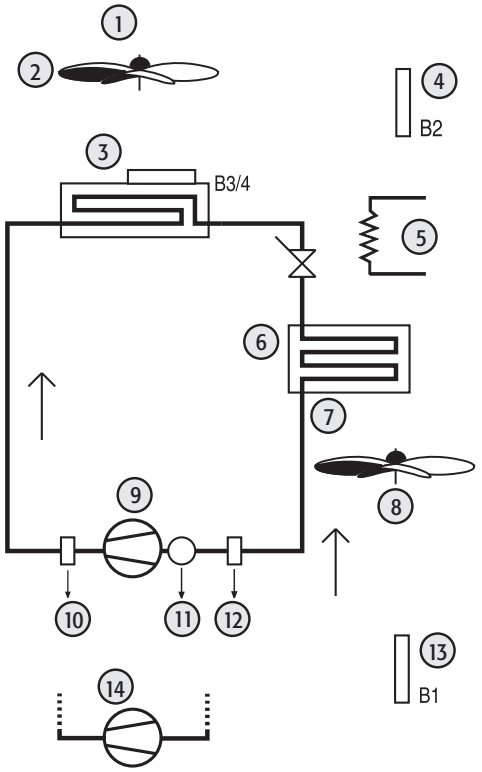


Fig. 3.a.a

3.1.2 Two circuits

Key:

1	condernser fan overload 1 and 2
2	fan
3	condenser probe
4	supply probe
5	electrical heater 1 and 2
6	evaporator 1 e 2
7	supply fan overload
8	supply fan
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1and 2
13	ambient probe
14	compressor 2
15	compressor 3
16	compressor 4

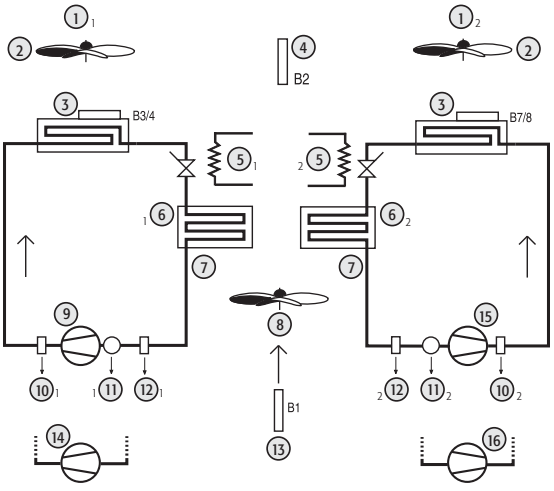
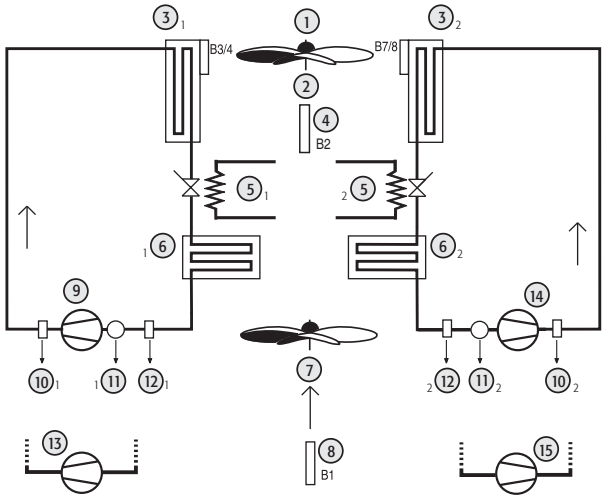


Fig. 3.a.b

3.1.2 Two circuits, 1 condenser fan circuit



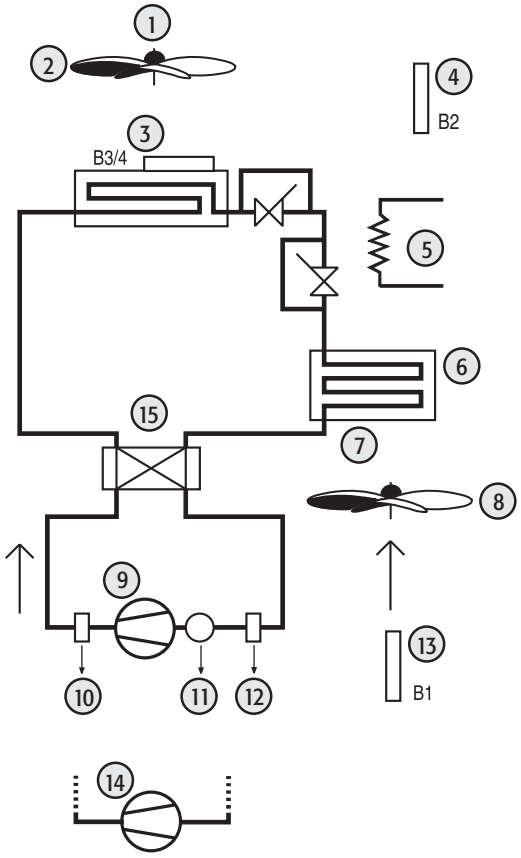
Key:

1	condernser fan overload
2	fan
3	condenser probe 1 and 2
4	supply probe
5	electrical heater 1 and 2
6	evaporator 1 and 2
7	supply fan
8	ambient probe
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1and 2
13	compressor 2
14	compressor 3
15	compressor 4

Fig. 3.a.c

3.2 AIR/AIR heat pump

3.2.1 Single circuit



Key:

1	condernser fan overload
2	fan
3	condenser probe
4	supply probe
5	electrical heater
6	evaporator
7	supply fan overload
8	supply fan
9	compressor 1
10	high pressure
11	compressor overload
12	low pressure
13	ambient probe
14	compressor 2
15	reversing valve

Fig. 3.b.a

3.2.2 Two circuits

Key:

1	condenser fan overload 1 and 2
2	fan
3	condernser probe
4	supply probe
5	electrical heater 1 e 2
6	evaporator 1 and 2
7	supply fan overload
8	supply fan
9	compressor 1
10	high pressure 1 e 2
11	compressor overload 1 and 2
12	low pressure 1and 2
13	ambient probe
14	compressor 2
15	reversing valve 1and 2
16	compressor 3
17	compressor 4

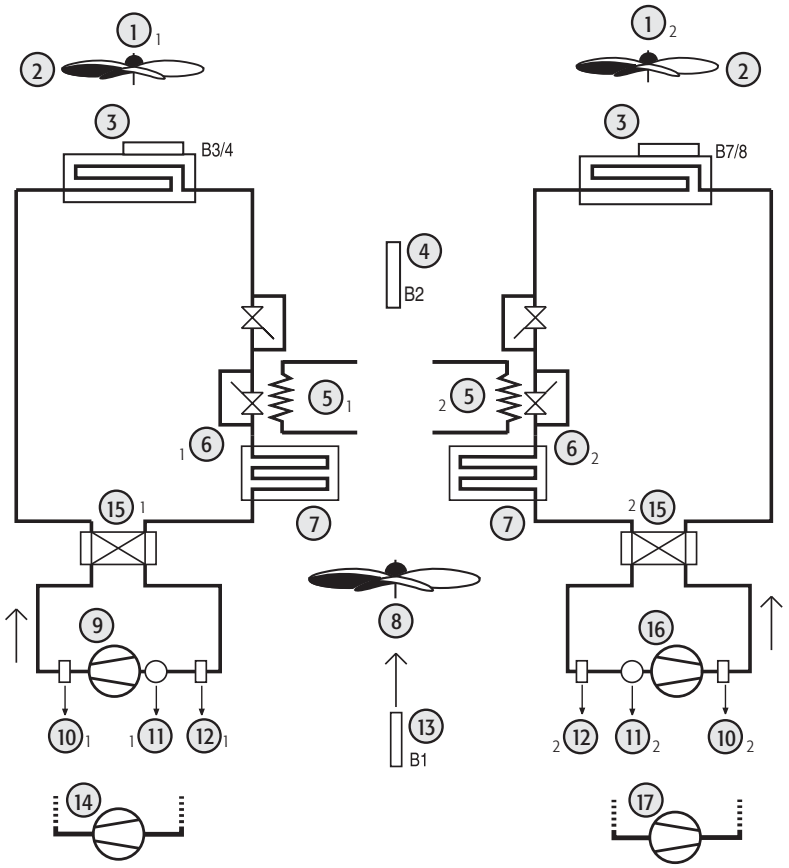


Fig. 3.b.b

3.2.3 Two circuits, 1 condenser fan circuit

Key:

1	condenser fan overload
2	fan
3	condernser probe 1 and 2
4	supply probe
5	electrical heater 1 e 2
6	evaporator 1 e 2
7	supply fan overload
8	supply fan
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1 and 2
13	ambient probe
14	compressor 2
15	reversing valve 1and 2
16	compressor 3
17	compressor 4

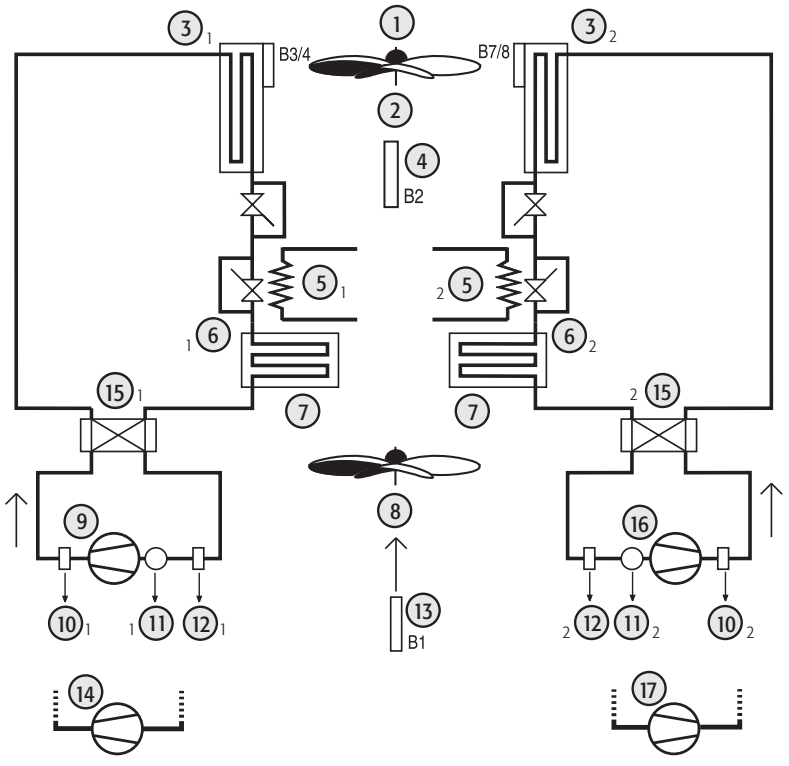


Fig. 3.b.c

3.3 AIR/WATER chiller

3.3.1 Single circuit

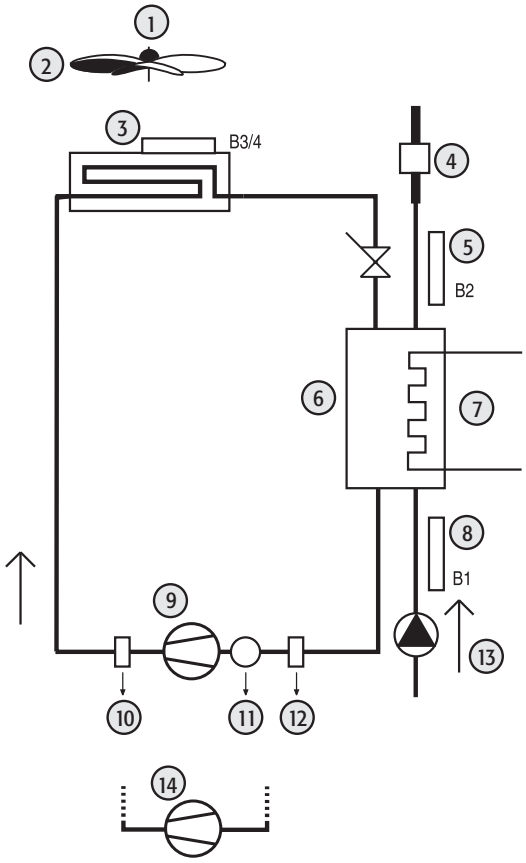


Fig. 3.c.a

Key:

1	condernser fan overload
2	fan
3	condenser probe
4	flow switch
5	outlet evaporator probe
6	fan
7	antifreeze heater
8	inlet evaporator probe
9	compressor 1
10	high pressure
11	compressor overload
12	low pressure
13	water pump
14	compressor 2

3.3.2 two circuits, 2 condenser fan circuits and 2 evaporators

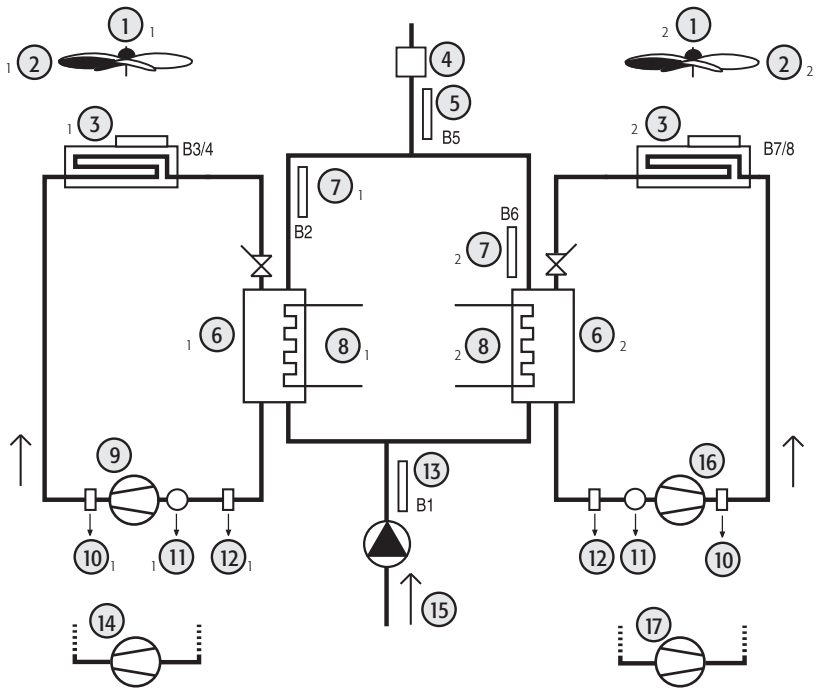


Fig. 3.c.b

Key:

1	condenser fan overload 1 and 2
2	fan 1 and 2
3	condenser probe 1 and 2
4	flow switch
5	outlet temperature probe
6	evaporator 1 and 2
7	outlet evaporator probe 1 and 2
8	antefreeze heater 1 and 2
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1and 2
13	inlet evaporator probe
14	compressor 2
15	water pump
16	compressor 3
17	compressor 4

3.3.2 two circuits, 1 condenser fan circuit

Key:

1	condenser fan overload
2	fan
3	condenser probe 1 and 2
4	flow switch
5	outlet temperature probe
6	evaporator 1 and 2
7	outlet evaporator probe 1 and 2
8	antifreeze heater 1 and 2
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1and 2
13	inlet evaporator probe
14	compressor 2
15	water pump
16	compressor 3
17	compressor 4

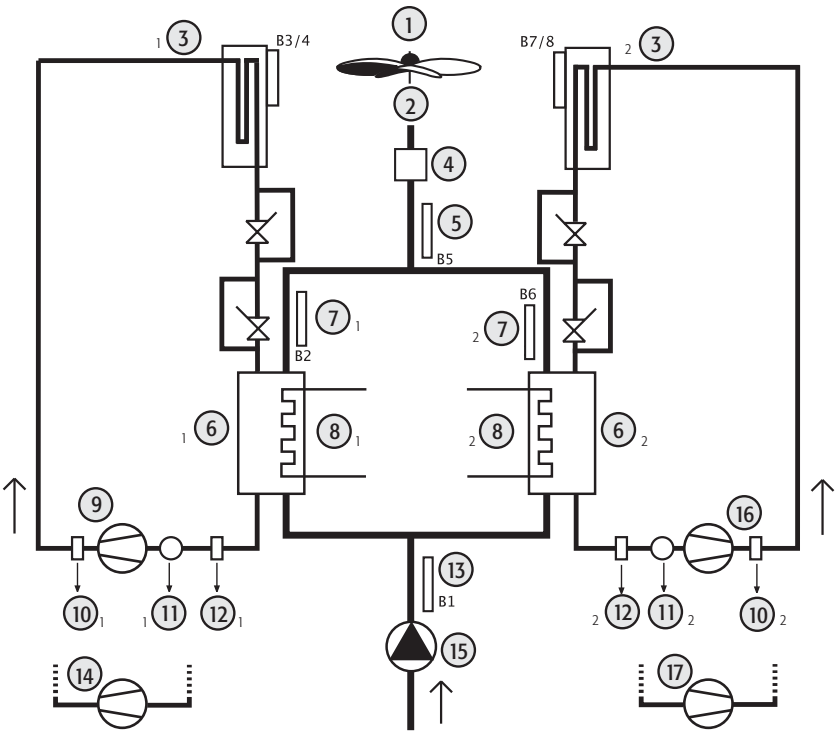


Fig. 3.c.c

3.4 AIR/WATER heat pump

3.4.1 Single circuit

Key:

1	condenser fan overload
2	fan
3	sonda condensatore
4	flow switch
5	outlet evaporator probe
6	evaporator
7	antifreeze heater
8	inlet evaporator probe
9	compressor 1
10	high pressure
11	compressor overload
12	low pressure
13	water pump
14	compressor 2

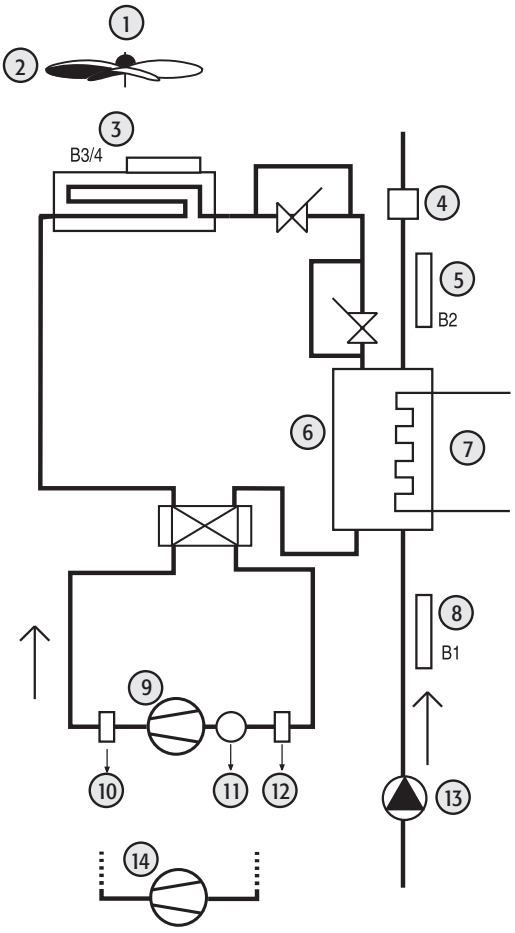


Fig. 3.d.a

3.4.2 2 condenser fan circuits

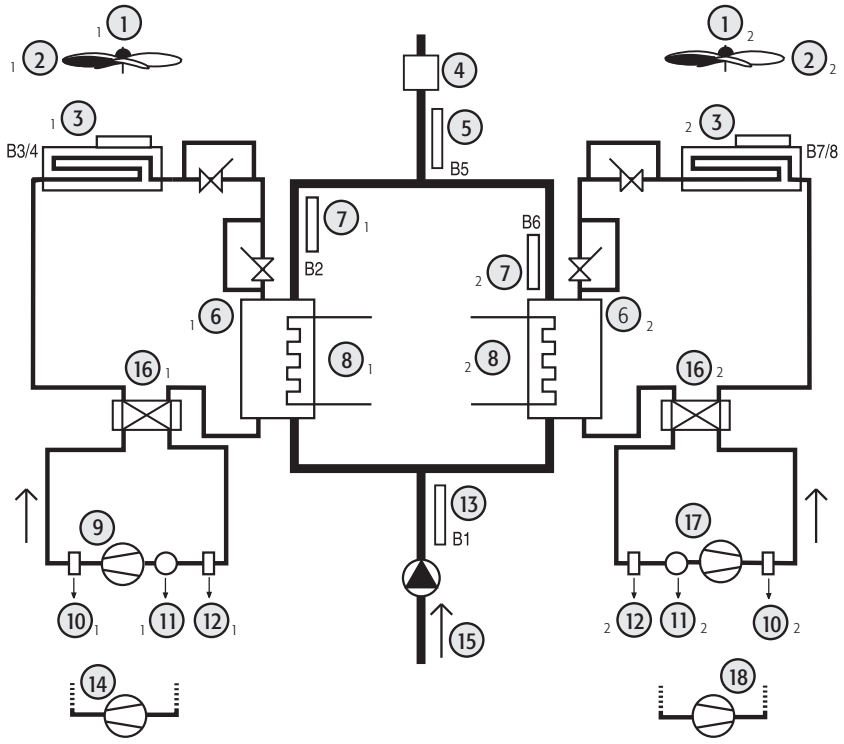


Fig. 3.d.b

Key:

1	condenser fan overload 1 and 2
2	fan 1 and 2
3	condenseer probe 1 and 2
4	flow switch
5	outlet temperature probe
6	evaporator 1 and 2
7	outlet evaporator probe 1 and 2
8	antifreeze heater 1 and 2
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1 and 2
13	inlet evaporator probe
14	compressor 2
15	water pump
16	reversing valve 1 and 2
17	compressor 3
18	compressor 4

3.4.3 two circuits, 1 condenser fan circuit

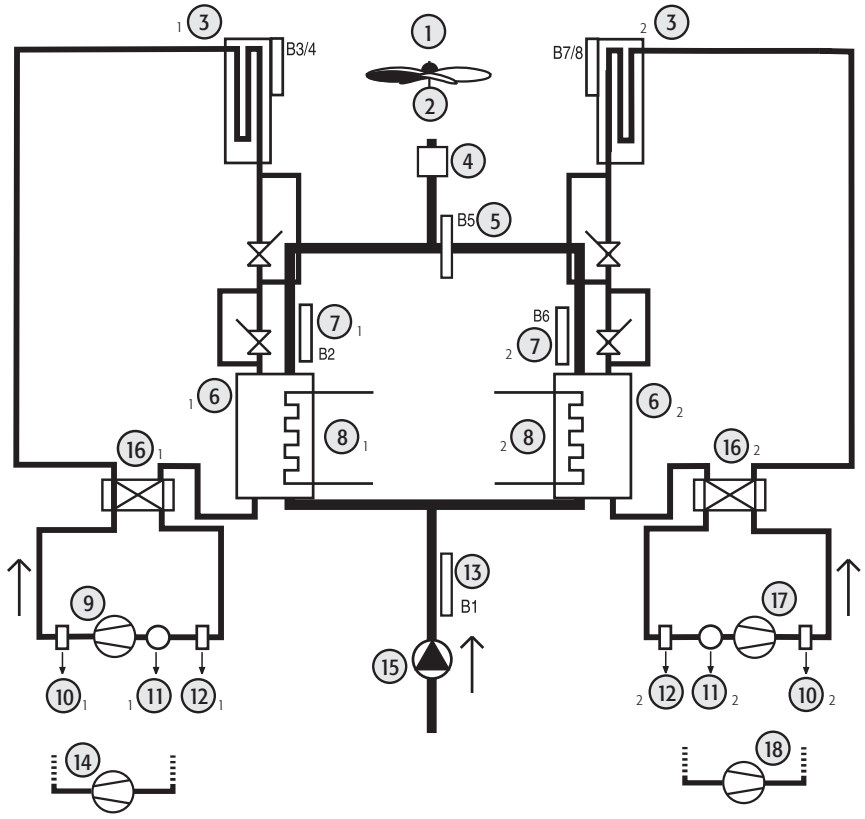


Fig. 3.d.c

Key:

1	condenser fan overload
2	fan
3	condenser probe 1 and 2
4	flow switch
5	outlet temperature probe
6	evaporator 1 and 2
7	outlet evaporator probe 1 and 2
8	antifreeze heater 1 and 2
9	compressor 1
10	hih pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1 and 2
13	inlet evaporator probe
14	compressor 2
15	water pump
16	reversing valve 1 and 2
17	compressor 3
18	compressor 4

3.5 WATER/WATER chiller

3.5.1 Single circuit

Key:

1	water condensing temperature probe
2	condensator
3	flow switch
4	outlet evaporator probe
5	evaporator
6	antifreeze heater
7	inlet evaporator probe
8	compressor 1
9	high pressure
10	compressor overload
11	low pressure
12	water pump
13	compressor 2

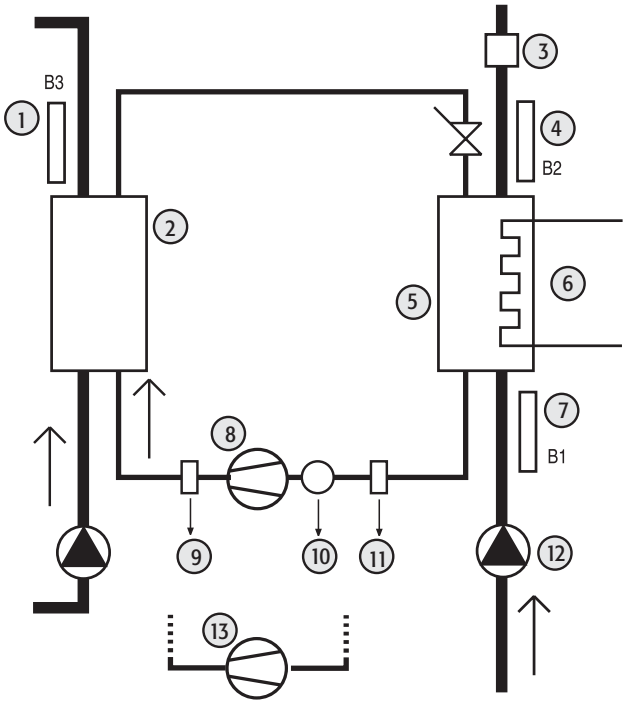


Fig. 3.e.a

3.5.2 Two circuits

Key:

1	water condensing temperature probe 1 and 2
2	condensator 1 and 2
3	flow switch
4	outlet evaporator probe
5	evaporator
6	antifreeze heater 1 and 2
7	compressor 1
8	high pressure 1 and 2
9	compressor overload 1 and 2
10	low pressure 1 and 2
11	inlet evaporator probe
12	water pump
13	compressor 2
14	compressor 3
15	compressor 4

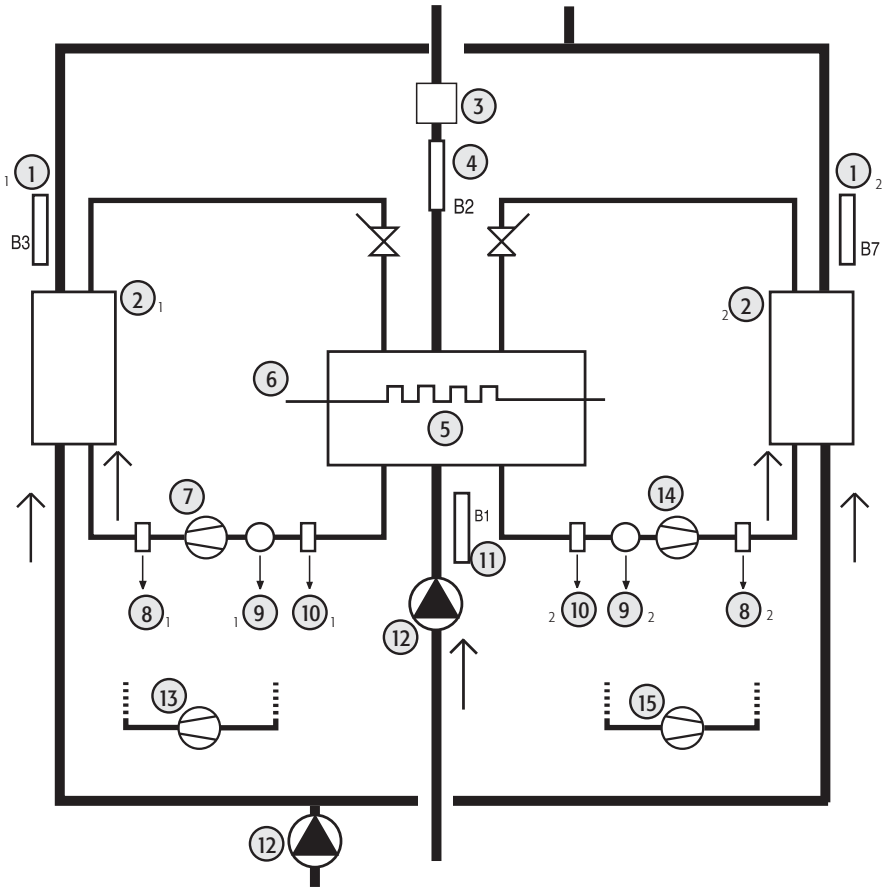


Fig. 3.e.b

3.5.3 Ttwo circuits, 2 evaporators

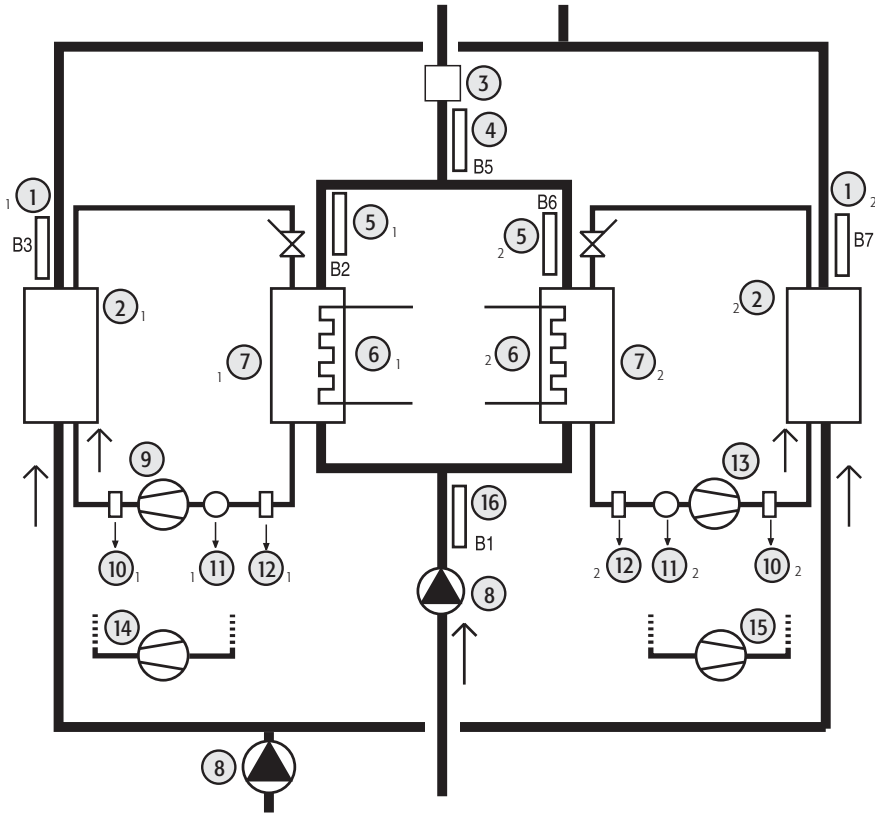


Fig. 3.e.c

Key:

1	water condensing temperature probe 1 and 2
2	condensator 1 and 2
3	flow switch
4	outlet temperature probe
5	outlet evaporator probe 1 and 2
6	antifreeze heater 1 and 2
7	evaporator
8	water pump
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1 and 2
13	compressor 3
14	compressor 2
15	compressor 4
16	inlet evaporator pressure

3.6 WATER/WATER heat pump with reversal on gas circuit

3.6.1 Single circuit

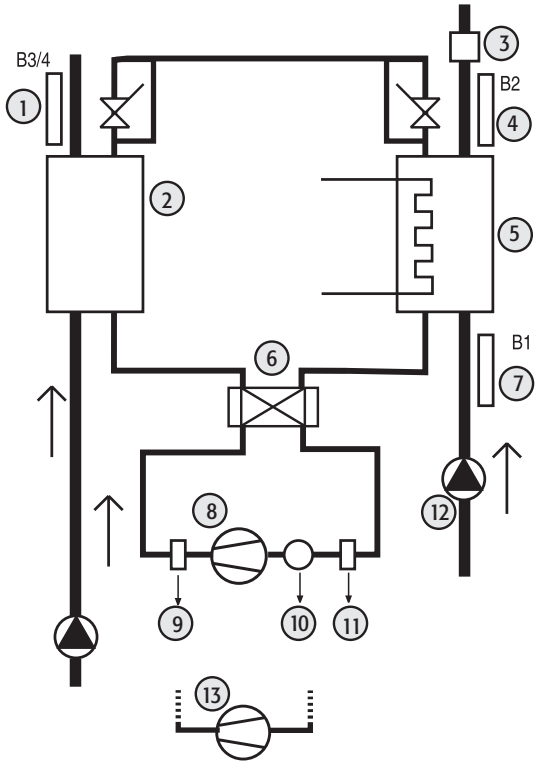


Fig. 3.f.a

Key:

1	condenser probe
2	condenser
3	flow switch
4	outlet evaporator probe
5	antifreeze heater
6	reversing valve
7	inlet evaporator probe
8	compressor 1
9	high pressure
10	compressor overload
11	low pressure
12	water pump
13	compressor 2

3.6.2 Two circuits

Key:

1	water condensing temperature probe 1 and 2
2	condensator 1 and 2
3	flow switch
4	outlet evaporator probe
5	outlet evaporator probe 1 and 2
6	evaporator 1 and 2
7	antifreeze heater 1 and 2
8	water pump
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1 and 2
13	inlet evaporator probe
14	compressor 2
15	compressor 3
16	revesing valve 1 and 2
17	compressor 4

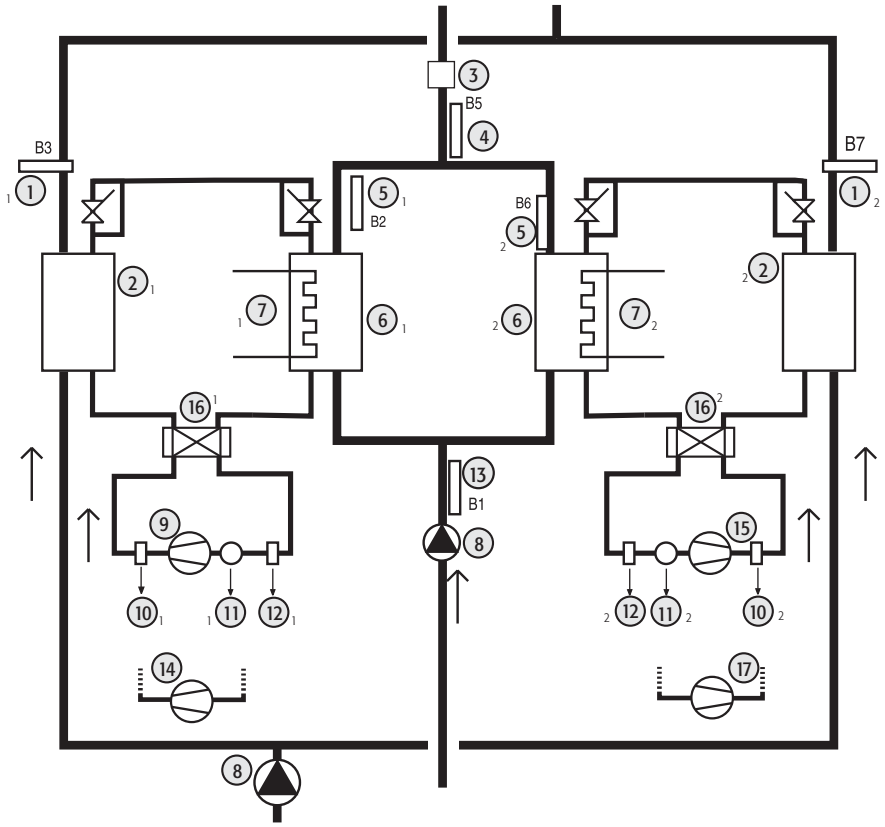


Fig. 3.f.b

3.6.3 Two circuits, 1 evaporator

Key:

1	condenser probe 1 and 2
2	condenser 1 and 2
3	flow switch
4	outlet evaporator probe
5	evaporator
6	antifreeze heater 1 and 2
7	compressor 1
8	high pressure 1 and 2
9	compressor overload 1 and 2
10	low pressure 1 and 2
11	inlet evaporator probe
12	water pump
13	compressor 2
14	reversing valve 1 and 2
15	compressor 3
16	compressor 4

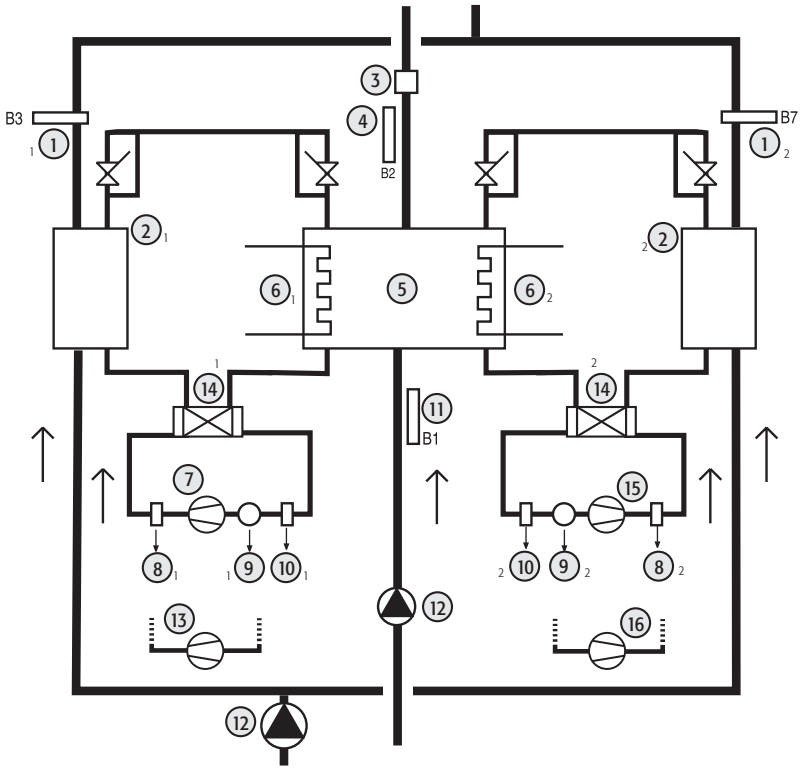


Fig. 3.f.c

3.7 WATER/WATER heat pump with reversal on water circuit

3.7.1 Single circuit

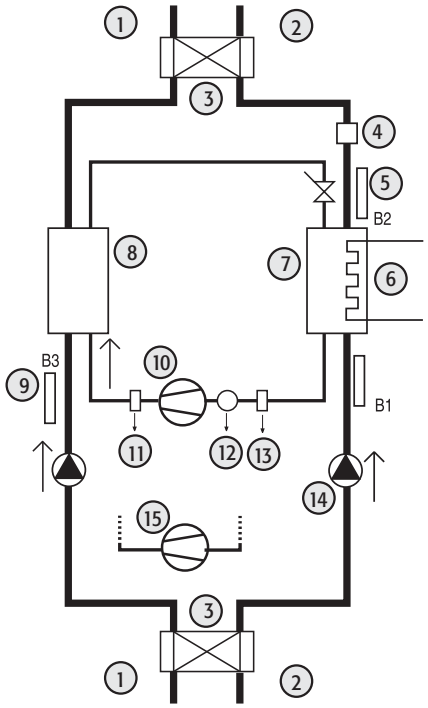


Fig. 3.g.a

Key:

1	external
2	internal
3	reversing valve
4	flow switch
5	outlet evaporator probe
6	antifreeze heater
7	evaporator
8	condenser
9	condenser probe
10	compressor 1
11	high pressure
12	compressor overload
13	low pressure
14	water pump
15	compressor 2

3.7.2 Two circuits, H02= 1 and H21= 4

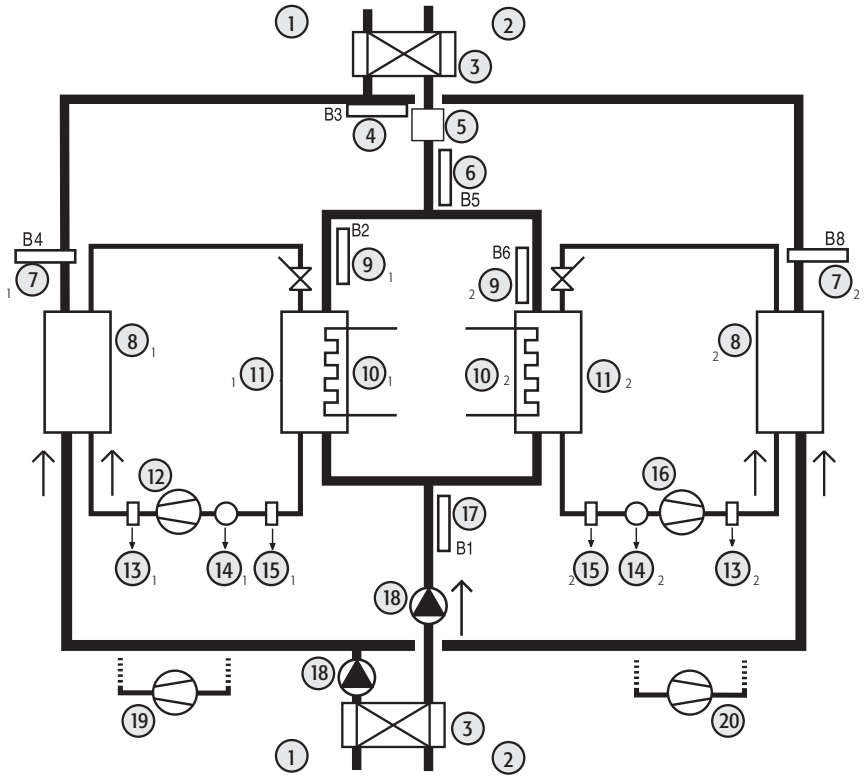


Fig. 3.g.b

Key:

1	external
2	internal
3	reversing valve 1 and 2
4	condenser probe
5	flow switch
6	outlet evaporator probe
7	condenser probe 1 and 2
8	condenser 1 and 2
9	outlet evaporator probe 1 and 2
10	antifreeze heater 1 and 2
11	evaporator 1 and 2
12	compressor 1
13	high pressure 1 and 2
14	compressor overload 1 and 2
15	low pressure 1 and 2
16	compressor 3
17	inlet evaporator probe
18	water pump
19	compressor 2
20	compressor 4

3.7.3 Two circuits, 1 evaporator H02= 1 e H21= 4

Key:

1	external
2	internal
3	reversing valve 1 and 2
4	condenser probe
5	flow switch
6	outlet evaporator probe
7	condenser probe 1 and 2
8	condenser 1 and 2
9	outlet evaporator probe 1 and 2
10	antifreeze heater 1 and 2
11	evaporator 1 and 2
12	compressor 1
13	high pressure 1 and 2
14	compressor overload 1 and 2
15	low pressure 1 and 2
16	compressor 3
17	inlet evaporator probe
18	water pump
19	compressor 2
20	compressor 4

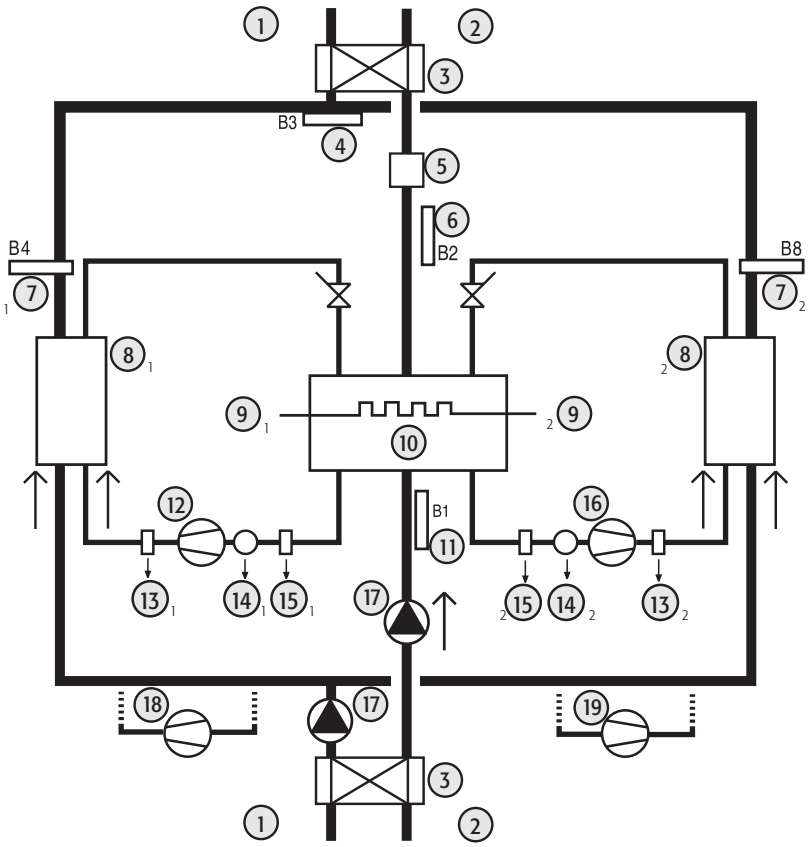


Fig. 3.g.c

3.8 Air-cooled condensing unit without reverse cycle

3.8.1 Single circuit

Key:

1	condenser fan overload
2	fan
3	condenser probe
4	compressor 1
5	high pressure
6	compressor overload
7	low pressure
8	compressor 2

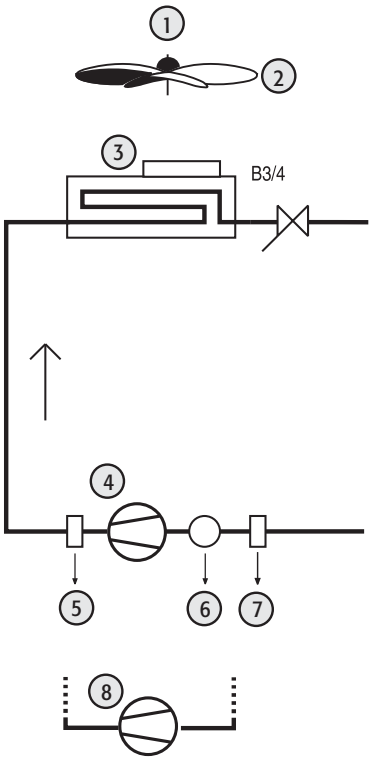


Fig. 3.h.a

3.8.2 Two circuits

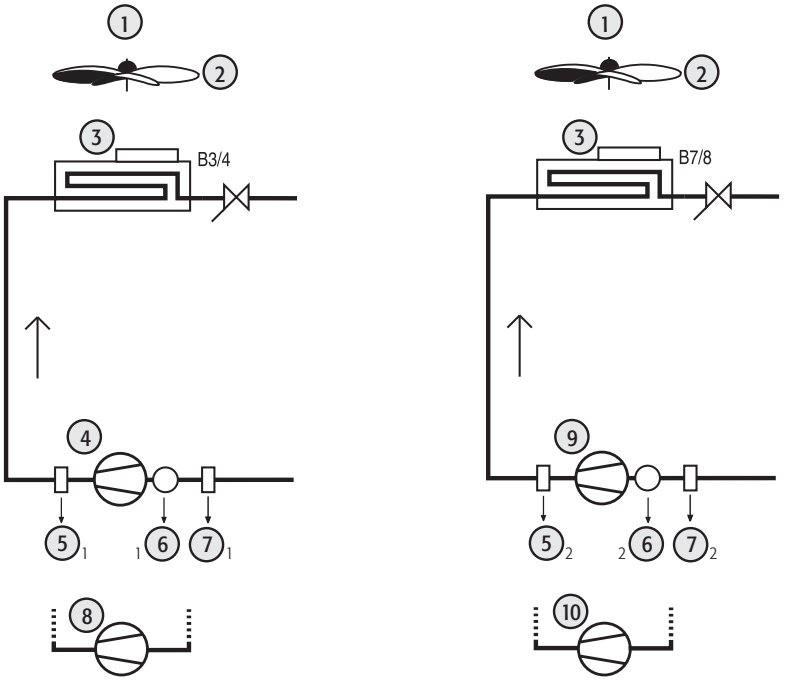


Fig. 3.h.b

Key:

1	condenser fan overload
2	fan
3	condenser probe
4	compressor 1
5	high pressure 1 and 2
6	compressor overload 1 and 2
7	low pressure 1 and 2
8	compressor 2
9	compressor 3
10	compressor 4

3.9 Reverse-cycle air-cooled condensing unit

3.9.1 Single circuit

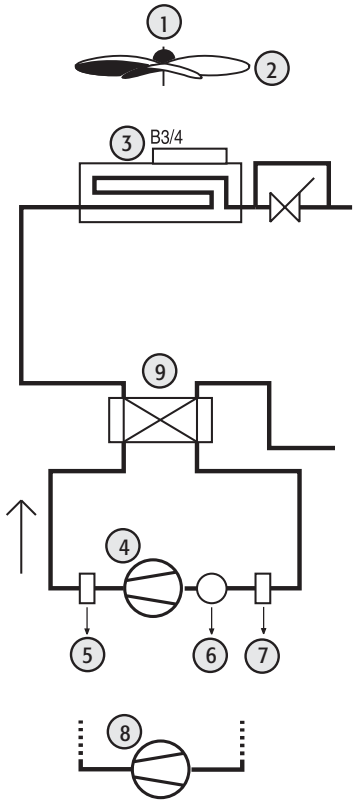


Fig. 3.i.a

Key:

1	condenser fan overload
2	fan
3	condenser probe
4	compressor 1
5	high pressure
6	compressor overload
7	low pressure
8	compressor 2
9	reversing valve

3.9.2 Two circuits with one condenser fan circuit

Key:

1	condenser fan overload
2	fan
3	condenser probe
4	compressor 1
5	high pressure 1 and 2
6	compressor overload 1 and 2
7	low pressure 1 and 2
8	compressor 2
9	compressor 3
10	compressor 4
11	reversing valve

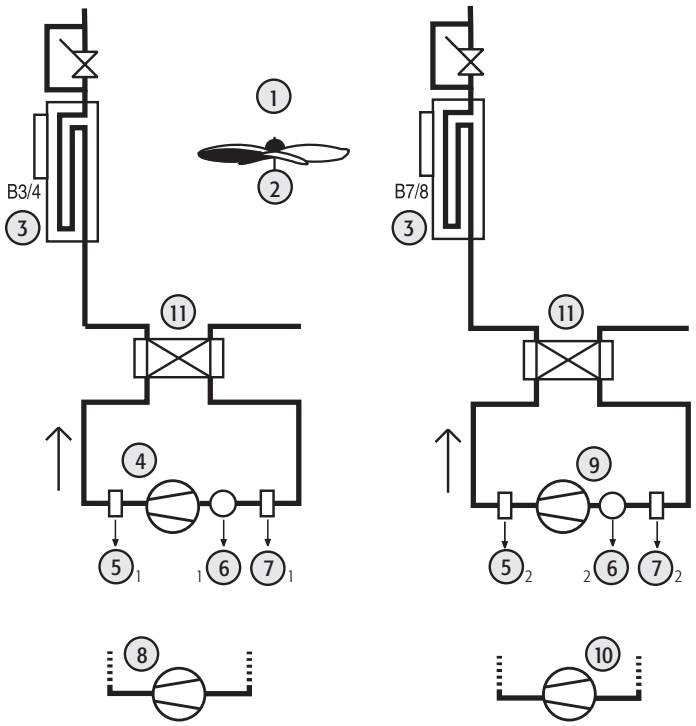


Fig. 3.i.b

3.10 Water-cooled condensing unit without reverse cycle

3.10.1 Single circuit

Key:

1	flow switch
2	water cond. temperature probe
3	condenser
4	compressor 1
5	high pressure
6	compressor overload
7	low pressure
8	compressor 2

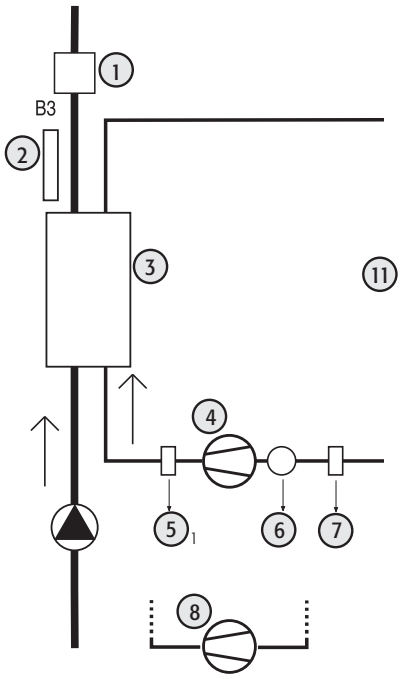


Fig. 3.j.a

3.10.2 Two circuits

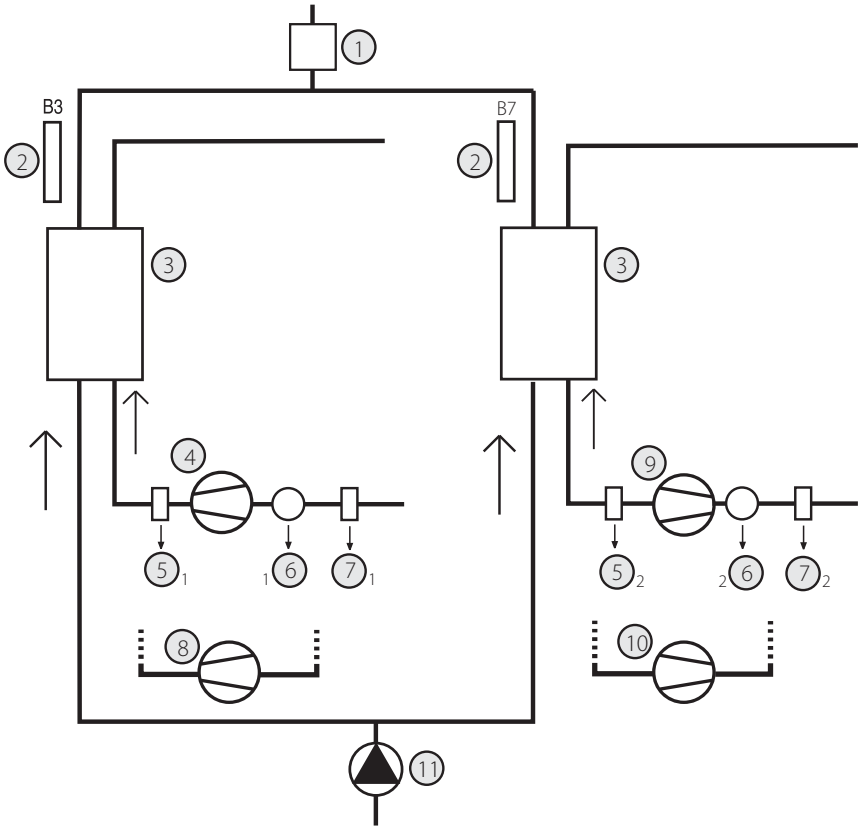


Fig. 3.j.b

Key:

1	flow switch
2	water cond. temperature probe
3	condenser
4	compressor 1
5	high pressure
6	compressor overload
7	lw pressure
8	compressor 2
9	compressor 3
10	compressor 4
11	water pump

3.11 Reverse-cycle water-cooled condensing unit

3.11.1 Single circuit

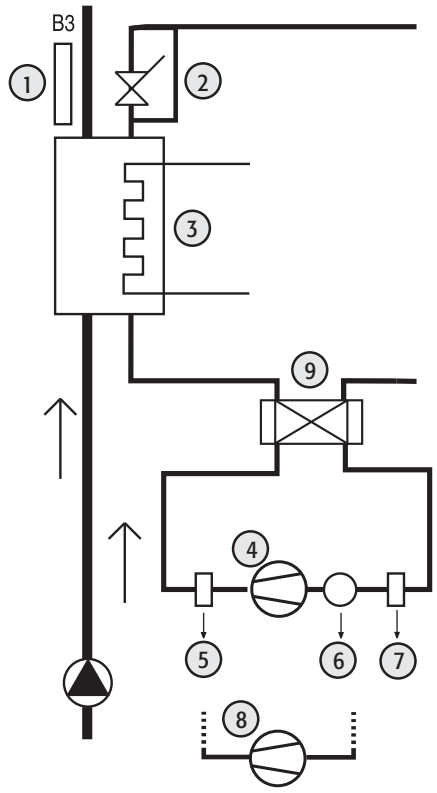


Fig. 3.k.a

Key:

1	condenser probe
2	condenser
3	antifreeze heater
4	compressor 1
5	high pressure
6	compressor overload
7	low pressure
8	compressor 2
9	reversing valve

3.11.2 Two circuits

Key:

1	condenser probe
2	condenser 1 and 2
3	antifreeze heater 1 and 2
4	reversing valve
5	compressor 1
6	high pressure 1 and 2
7	compressor overload 1 and 2
8	low pressure 1 and 2
9	compressor 3
10	compressor 2
11	compressor 4
12	water pump

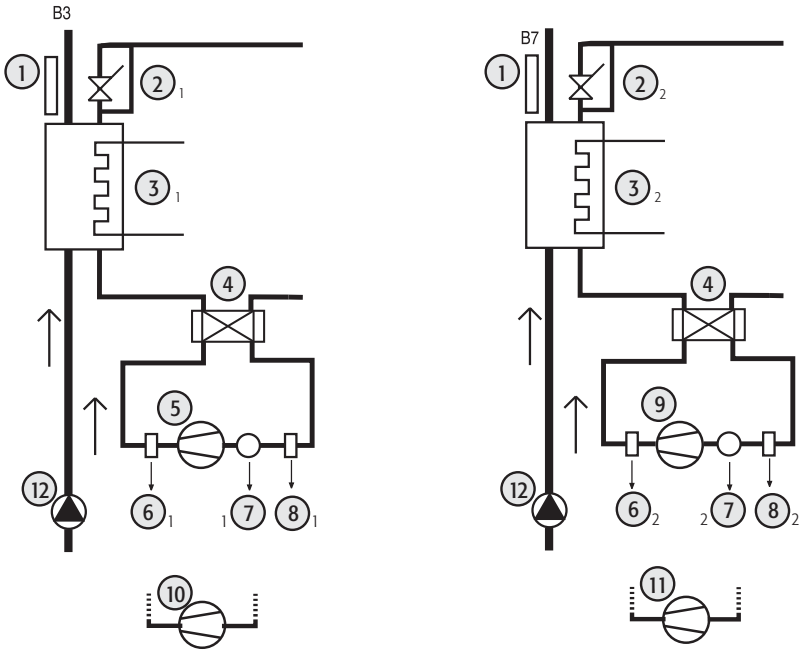


Fig. 3.k.b

3.12 Roof Top units

3.12.1 Example of Roof Top units with two circuits

Key:

1	condenser fan overload
2	fan
3	condernser probe 1 and 2
4	supply probe
5	electrical heater 1 e 2
6	evaporator 1 e 2
7	supply fan overload
8	supply fan
9	compressor 1
10	high pressure 1 and 2
11	compressor overload 1 and 2
12	low pressure 1 and 2
13	ambient probe
14	compressor 2
15	reversing valve 1and 2
16	compressor 3
17	compressor 4
18	freecooling/freeheating damper
19	enable humidifier

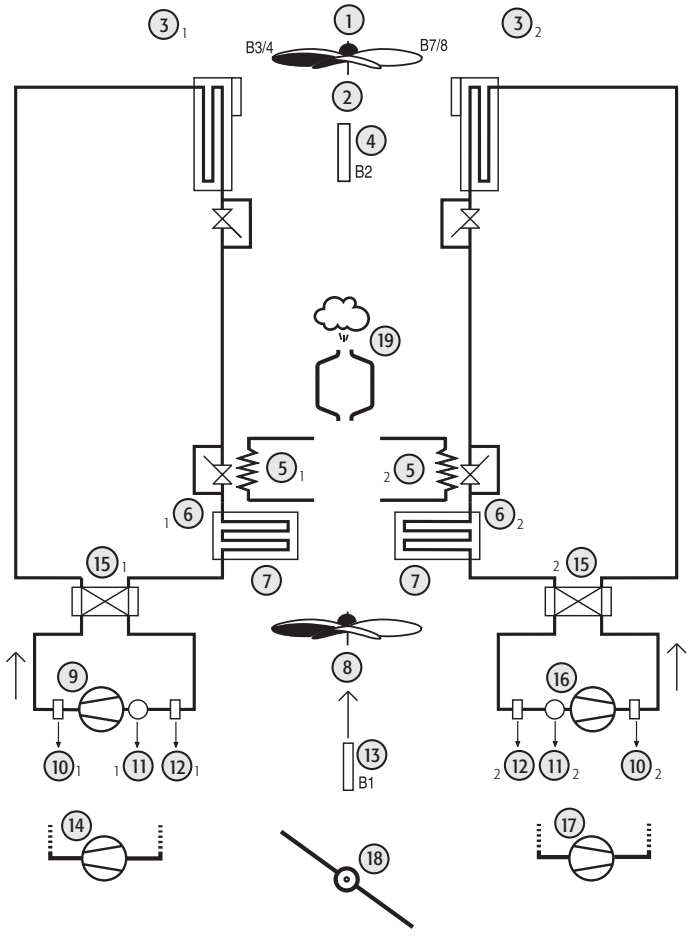


Fig. 3.k.l

4. PARAMETERS

4.1 General parameters

The parameters are divided into 4 different types, according to their level of access by the user (password) and their function.
For each level, only the access to the parameters of the same or lower level can be set.
This means that through "factory" password, acessing the menù "levels" (L-P), it is possible to set the desired level for each parameter.

- **Factory parameters:** Accessible with the 66 "Factory" password, allow the configuration of all the unit parameters.
- **Super User parameters:** Accessible with the 11 "Super User" password, allow the configuration of the Super User, User and Direct parameters.
- **User parameters:** Accessible with password 22, allow the configuration of the parameters that typically can be set by the user (User parameters) and the Direct parameters, consequently relating to the options.
- **Direct parameters:** Accessible without password, this are used to read the probe measurements and any data, by any user, without compromising the operation of the unit.

N.B.: The modifications to the parameters regarding the configuration of the unit (type, number of compressors,...) must be performed with the controller in Standby.

level	level name	password
_d_	direct	no password
_U_	user	22
_S_	super user	11
_F_	factory	66

4.2 Menu structure

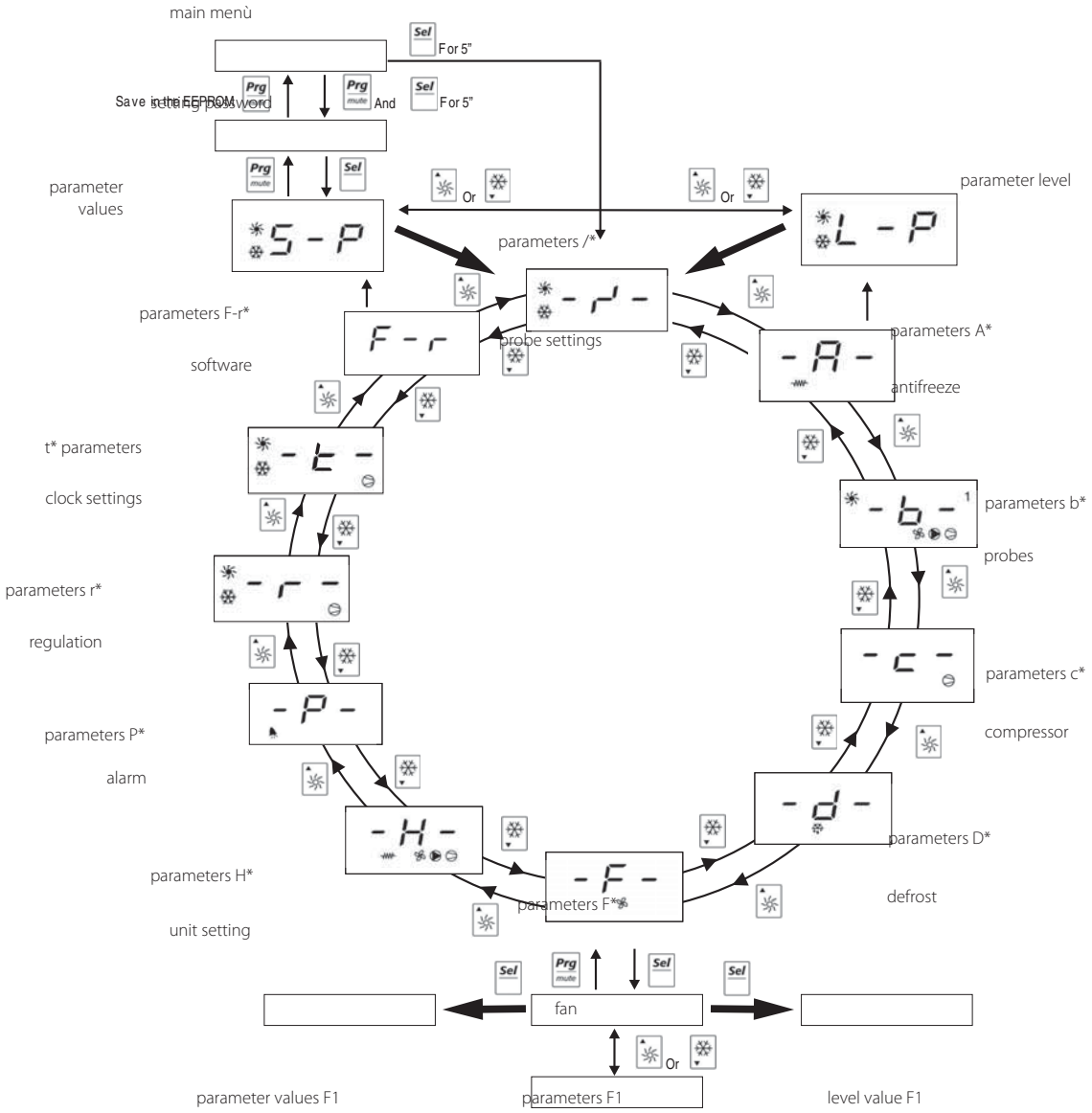


Fig. 4.a

4.3 Parameter tables

The following tables show of the parameters divided by type/family (e. g. compressor, probes, fans etc.).

• Key to the parameter tables

Level (default)
S= super user
F= factory
D= direct

Visibility:

The visibility of some groups depends on the type of controller and the value of the parameters.
D= defrost (if D01=1)
F= fan (if F01=1)
L= low noise (if F15=1-3)
N= NTC probe (if /04-/08=2)
P= pressure (if /04-/08=3)
V= driver (if H08 =1, 3, 4)
X= expansion (if H08=2, 3, 4)
M= pump down (if D17=1)
W= watch (if the clock board is fitted)
- = always present

Supervisor variables:

R/W = supervisor read/write parameter
R= supervisor read-only parameter

4.3.1 Evaporator and condenser temperature and pressure values: (d*)

display indicat.	parameter and description	default level	min.	max.	UOM	variat.	default	visibility	supervis. variable	Modbus	variable type
dtE	Current value of DTE	D	0	0	-	-	0	-	99 (R)	99	Analog
dC1	Current value of DTC1	D	0	0	-	-	0	-	100 (R)	100	Analog
dC2	Current value of DTC2	D	0	0	-	-	0	-	101 (R)	101	Analog

Tab. 4.a

4.3.2 Probe setting parameters: (/*)

display indicat.	parameter and description		default level	min.	max.	UOM	variat.	default	visibility	supervis. variable	Modbus	variable type
/01	Probe type B1	0= not present 1= present	F	0	1	Flag	1	1	-	1 (R/W)	1	Digital
/02	Probe type B2	0= not present 1= present	F	0	1	Flag	1	0	-	2 (R/W)	2	Digital
/03	Probe type B3	0= not present 1= NTC Cond. Probe 2= NTC Out. Probe 3= differential control probe	F	0	3	int	1	0	-	14 (R/W)	221	Integer
/04	Probe type B4	0= not present 1= ON/OFF (D.I) 2= NTC Out. Probe 3= ratiometric cond. Probe, 5 Vdc 4= differential control probe	F	0	4	int	1	0	-	15 (R/W)	222	Integer
/05	Probe type B5	0= not present 1= present	F	0	1	Flag	1	0	X	3 (R/W)	3	Digital
/06	Probe type B6	0= not present 1= present	F	0	1	Flag	1	0	X	4 (R/W)	4	Digital
/07	Probe type B7	0= not present 1= NTC Cond. Probe 2= NTC Out. Probe 3= differential control probe	F	0	2	int	1	0	X	16 (R/W)	223	Integer
/08	Probe type B8 (expansion)	0= not present 1= ON/OFF 2= NTC Out. Probe 3= ratiometric cond. Probe, 5 Vdc 4= differential control probe NB. if more than one differential control probe is configured, the priority is: B8, B7, B4, B3	F	0	3	int	1	0	X	17 (R/W)	224	Integer
/09	Min. value voltage input		F	0	/10	0.01 Vdc	1	50	P	18 (R/W)	225	Integer
/10	Max. value voltage input		F	/09	500	0.01 Vdc	1	450	P	19 (R/W)	226	Integer
/11	Pressure min. value		F	0	/12	bar	1	0	P	1 (R/W)	1	Analog
/12	Pressure max. value		F	/11	99.9	bar	1	34.5	P	2 (R/W)	2	Analog
/13	Probe B1 calibration		F	-12.0	12.0	°C/°F	0.1	0.0	-	3 (R/W)	3	Analog
/14	Probe B2 calibration		F	-12.0	12.0	°C/°F	0.1	0.0	-	4 (R/W)	4	Analog
/15	Probe B3 calibration		F	-12.0	12.0	°C/°F	0.1	0.0	-	5 (R/W)	5	Analog
/16	Probe B4 calibration		F	-12.0	12.0	°C/bar/°F	0.1	0.0	-	6 (R/W)	6	Analog
/17	Probe B5 calibration		F	-12.0	12.0	°C/°F	0.1	0.0	X	7 (R/W)	7	Analog
/18	Probe B6 calibration		F	-12.0	12.0	°C/°F	0.1	0.0	X	8 (R/W)	8	Analog
/19	Probe B7 calibration		F	-12.0	12.0	°C/°F	0.1	0.0	X	9 (R/W)	9	Analog
/20	Probe B8 calibration		F	-12.0	12.0	°C/bar/°F	0.1	0.0	X	10 (R/W)	10	Analog
/21	Digital filter		U	1	15	-	1	4	-	20 (R/W)	227	Integer
/22	Input limitation		U	1	15	-	1	8	-	21 (R/W)	228	Integer
/23	Unit of measure	0= °C 1= °F	U	0	1	Flag	1	0	-	5 (R/W)	5	Digital

Table. 4.b

4.3.3 Antifreeze/support heater setting parameters (A*)

display indicat.	parameter and description	default level	min.	max.	UOM	variat.	default	visibility	supervis. variable	Modbus	variable type
A01	Alarm set point antifreeze/low ambient temperature (air/air)	U	A07	A04	°C/°F	0.1	30	-	11 (R/W)	11	Analog
A02	Differential for antifreeze/low ambient temperature alarm (air/air)	U	3	1220	°C °F	0.1	50	-	12 (R/W)	12	Analog
A03	Bypass time for antifreeze alarm/low ambient temp. when turning on the unit in heating mode	U	0	150	s	1	0	-	22 (R/W)	229	Integer
A04	Set point for the activation of antifreeze heater/auxiliary heater	U	A01	r16	°C/°F	0.1	50	AA	13 (R/W)	13	Analog
A04	Antifreeze/support heater set point differential	U	0	200	°C/°F	0.1	70	AR	77 (R/W)	77	Analog
A05	Diff. for antifreeze heater/auxiliary heater	U	3	500	°C/°F	0.1	10	-	14 (R/W)	14	Analog
A06	Auxiliary heater probe 0= Control probe see (see Table 5.a) 1= Antifreeze probe see (see Table 5.a)	F	0	1	Flag	1	0	-	6 (R/W)	6	Digital
A07	Antifreeze alarm set point limit	F	-400	1760	°C °F	0.1	-400	-	15 (R/W)	15	Analog
A08	Auxiliary heater set point in heating mode	U	A01	r16	°C °F	0.1	250	AA	16 (R/W)	16	Analog
A08	Antifreeze/support heater set point differential	U	0	200	°C °F	0.1	70	AR	78 (R/W)	78	Analog
A09	Auxiliary heater differential in heating mode	U	3	500	°C/°F	0.1	30	-	17 (R/W)	17	Analog
A10	Antifreeze automatic start up 0= disabled function 1= Heaters and pump on at the same time on A4/A8 2= Heaters and pump on indipendently on A4/A8 3= Heaters ON on A4/A8	U	0	3		1	0	-	23 (R/W)	230	Integer
A11	Auxiliary heater 2 set point in heating	U	A01	r16	°C/°F	0.1	250	AA	67 (R/W)	67	Analog
A11	Support heater 2 differential in heating	U	0	200	°C/°F	0.1	70	AR	79 (R/W)	79	Analog
A12	T diff. set point for dirty filters (air/air)	U	0	1760	°C/°F	0.1	150	-	57 (R/W)	57	Analog
A13	Outlet limit set point in freecooling conditions	U	A07	r16	°C/°F	0.1	30	-	80 (R/W)	80	Analog
A14	Antifreeze alarm set point from EVD	U	A07	A04	°C/°F	0.1	30	-	82 (R/W)	82	Analog

Table 4.c

4.3.4 Probe reading parameters (b*)

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	default	visibility	supervis. variable	Modbus	variable type
b00	Config. of probe to be shown on the display 0= probe B1 1= probe B2 2= probe B3 3= probe B4 4= probe B5 5= probe B6 6= probe B7 7= probe B8 8= set point without compensation 9= dynamic set point with possible compensation 10= remote ON/OFF digital input status 11= µAD probe	U	0	11	N	1	0	-	24 (R/W)	231	integer
b01	Value read by probe B1	D	0	0	°C /°F	-	0	-	102 (R)	102	Analog
b02	Value read by probe B2	D	0	0	°C /°F	-	0	-	103 (R)	103	Analog
b03	Value read by probe B3	D	0	0	°C /°F	-	0	-	104 (R)	104	Analog
b04	Value read by probe B4	D	0	0	°C /°F/ Dbar	-	0	-	105 (R)	105	Analog
b05	Value read by probe B5	D	0	0	°C /°F	-	0	X	106 (R)	106	Analog
b06	Value read by probe B6	D	0	0	°C /°F	-	0	X	107 (R)	107	Analog
b07	Value read by probe B7	D	0	0	°C /°F	-	0	X	108 (R)	108	Analog
b08	Value read by probe B8	D	0	0	°C /°F/ Dbar	-	0	X	109 (R)	109	Analog
b09	Driver 1 evaporator temperature	D	0	0	°C /°F	-	0	V	110 (R)	110	Analog
b10	Driver 1 evaporator pressure	D	0	0	Dbar	-	0	V	111 (R)	111	Analog
b11	Driver 1 superheating	D	0	0	°C /°F	-	0	V	112 (R)	112	Analog
b12	Driver 1 saturation temperature	D	0	0	°C /°F	-	0	V	113 (R)	113	Analog
b13	Driver 1 valve position	D	0	1000	%	-	0	V	114 (R)	114	Analog
b14	Driver 2 evaporator temperature	D	0	0	°C /°F	-	0	XV	115 (R)	115	Analog
b15	Driver 2 evaporator pressure	D	0	0	Dbar	-	0	XV	116 (R)	116	Analog
b16	Driver 2 superheating	D	0	0	°C /°F	-	0	XV	117 (R)	117	Analog
b17	Driver 2 saturation temperature	D	0	0	°C /°F	-	0	XV	118 (R)	118	Analog
b18	Driver 2 valve position	D	0	1000	%	-	0	XV	119 (R)	119	Analog
b19	Temp. probe at the outlet of the external coil c1	D	0	0	°C /°F	-	0	V	120 (R)	120	Analog
b20	Temp. probe at the outlet of the external coil c12	D	0	0	°C /°F	-	0	XV	121 (R)	121	Analog
b21	Terminal probe (for µAD terminal)	D	-400	800	°C /°F	0.1	0	-	128 (R/W)	128	Analog

Table 4.d

4.3.5 Compressor setting parameters (c*)

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	def.	visib.	supervis. variable	Modbus	variabile type
c01	Minimum on time	U	0	999	s	1	60	-	25 (R/W)	232	Integer
c02	Minimum off time	U	0	999	s	1	60	-	26 (R/W)	233	Integer
c03	Delay between 2 starts of the same compressor	U	0	999	s	1	360	-	27 (R/W)	234	Integer
c04	Delay between starts of the 2 compressors	U	0	999	s	1	10	-	28 (R/W)	235	Integer
c05	Delay between 2 shut-downs of the 2 compressors	U	0	999	s	1	0	-	29 (R/W)	236	Integer
c06	Delay at start-up	U	0	999	s	1	0	-	30 (R/W)	237	Integer
c07	Delay in switching on the compressor after switching on the pump/inlet fan (air/air)	U	0	999	s	1	20	-	31 (R/W)	238	Integer
c08	Delay in switching OFF the compressor after switching OFF the pump/inlet fan (air/air)	U	0	150	min	1	1	-	32 (R/W)	239	Integer
c09	Maximum compressor operating time in tandem	U	0	60	min	1	0	-	33 (R/W)	240	Integer
c10	Compressor 1 timer	D	0	8000	100 hours	-	0	-	122 (R)	122	Analog
c11	Compressor 2 timer	D	0	8000	100 hours	-	0	-	123 (R)	123	Analog
c12	Compressor 3 timer	D	0	8000	100 hours	-	0	-	124 (R)	124	Analog
c13	Compressor 4 timer	D	0	8000	100 hours	-	0	-	125 (R)	125	Analog
c14	Operation timer threshold	U	0	100	100 hours	1	0	-	34 (R/W)	241	Integer
c15	Hour counter evaporator pump/fan 1	D	0	8000	100 hours	-	0	-	126 (R)	126	Analog
c16	Hour counter condenser backup pump/fan 2	D	0	8000	100 hours	-	0	-	127 (R)	127	Analog
c17	Minimum time between 2 pump starts	U	0	150	min	1	30	-	35 (R/W)	242	Integer
c18	Minimum pump ON time	U	0	15	min	1	3	-	36 (R/W)	243	Integer
c19	Delay between valve and compressor	U	0	100	s	1	3	-	125(R/W)	332	Integer

Table 4.e

4.3.6 Defrost setting parameters (d*)

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	default	visibility	supervis. variable	Modbus	variable type
d01	Defrosting cycle/Condenser antifreeze 0= no; 1= yes, with shared defrosting	U	0	1	Flag	1	0	-	7 (R/W)	7	Digital
d02	Time-or temperature-based defrosting 0= time 1= temp. - press 2= pressure start, temperature end 3= activate sliding defrost	U	0	3	Flag	1	0	D	90 (R/W)	297	Integer
d03	Start defrosting temperature Condenser antifreeze alarm set point	U	-400	d04	°C/°F	0.1	-50	DN	19 (R/W)	19	Analog
	Start defrosting pressure Condenser antifreeze alarm set point	U	/11	d04	Dbar	0.1	35	DP	18 (R/W)	18	Analog
d04	End defrost temperature	U	d03	/12	Dbar	0.1	140	DP	20 (R/W)	20	Analog
	End defrost pressure		d03	1760	°C/°F	0.1	200	DN	21 (R/W)	21	Analog
d05	Min. time to start a defrosting cycle	U	10	150	s	1	10	D	37 (R/W)	244	Integer
d06	Min. duration of a defrosting cycle	U	0	150	s	1	0	D	38 (R/W)	245	Integer
d07	Max. duration of a defrosting cycle	U	1	150	min	1	5	D	39 (R/W)	246	Integer
d08	Delay between 2 defrosting cycle requests within the same circuit	U	10	150	min	1	30	D	40 (R/W)	247	Integer
d09	Defrosting delay between the 2 circuits	U	0	150	min	1	10	D	41 (R/W)	248	Integer
d10	Defrost by external contact 0= disables function 1= external contact start 2= external contact end 3= external contact start and end	F	0	3	Flag	1	0	D	42 (R/W)	249	Integer
d11	Antifreeze heater in defrost	U	0	1	Flag	1	0	D	9 (R/W)	9	Digital
d12	Waiting time before defrosting	F	0	3	min	1	0	D	43 (R/W)	250	Integer
d13	Waiting time after defrosting	F	0	3	min	1	0	D	44 (R/W)	251	Integer
d14	End defrosting with 2 refrigerating circuits 0= Indipendent 1= If both at end defrost 2= If at least one at end defrost	F	0	2	Flag	1	0	D	45 (R/W)	252	Integer
d15	Start defrost with 2 circuits 0= Indipendent 1= If both at start defrost 2= If at least one at start defrost	F	0	2	Int	1	0	D	46 (R/W)	253	Integer
d16	Forced ventilation time at the end of the defrosting	F	0	360	s	1	0	D	47 (R/W)	254	Integer
d17	Set/enable light defrost	F	0	800	°C/°F	0.1	0	D	22 (R/W)	22	Analog
d18	Max. outside temperature (sliding defrost)	F	-400	800	°C/°F	0.1	-100	D	62 (R/W)	62	Analog
d19	Start defrost differential (sliding defrost)	F	-400	800	°C/°F/bar	0.1	30	D	63 (R/W)	63	Analog
d20	Outside temperature differential (sliding defrost)	F	10.0	800	°C/°F	0.1	100	D	64 (R/W)	64	Analog

Table 4.f

4.3.7 Fan setting parameters (F*)

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	def.	visibility	supervis. variable	Modbus	variable type
F01	Enable Fan output 0=not present 1=present	F	0	1	Flag	1	0	-	10 (R/W)	10	Digital
F02	Fan operating mode 0= always ON 1= depending ON the compressor (in parallel operation mode) 2= depending ON the compressors in ON/OFF control 3= depending ON the compressors in speed control mode	U	0	3	Int	1	0	F	48 (R/W)	255	Integer
F03	Min. voltage threshold for Triac	F	0	F04	step	1	35	F	49 (R/W)	256	Integer
F04	Max. voltage threshold for Triac	F	F03	100	step	1	75	F	50 (R/W)	257	Integer
F05	Speed temp. set point in Cooling mode	U	-400	1760	°C/°F	0.1	350	FN	24 (R/W)	24	Analog
	Pressure value for min. speed Cooling	U	/11	/12	Dbar	0.1	130	FP	23 (R/W)	23	Analog
F06	Differential value for max. speed Cooling	U	0	500	°C/°F	0.1	100	FN	26 (R/W)	26	Analog
	Pressure value for max. speed Cooling	U	0	300	Dbar	0.1	30	FP	25 (R/W)	25	Analog
F07	Fan shut-down differential in Cooling mode	U	0	500	°C/°F	0.1	150	FN	28 (R/W)	28	Analog
	Fan shut-down pressure in Cooling mode	U	0	F05	Dbar	0.1	50	FP	27 (R/W)	27	Analog
F08	Speed temp. set point in Heating mode	U	-400	1760	°C/°F	0.1	350	FN	30 (R/W)	30	Analog
	Pressure value for max speed in Heating	U	/11	/12	Dbar	0.1	130	FP	29 (R/W)	29	Analog
F09	Max. speed diff. in Heating mode	U	0	500	°C/°F	0.1	50	FN	32 (R/W)	32	Analog
	Pressure value for max speed in Heating	U	0	F08	Dbar	0.1	40	FP	31 (R/W)	31	Analog
F10	Fan shutdown diff. in Heating mode	U	0	F08	°C/°F	0.1	50	FN	34 (R/W)	34	Analog
	Pressure to turn OFF the fan in Heating	U	0	300	Dbar	0.1	30	FP	33 (R/W)	33	Analog
F11	Fan starting time	U	0	120	s	1	0	F	51 (R/W)	258	Integer
F12	Triac impulse duration (fan start)	F	0	10	s	1	2	F	52 (R/W)	259	Integer
F13	Fan management in defrost mode 0= Fans deactivated 1= Fans in chiller mode 2= Maximum speed after defrost	F	0	2	Int	1	0	F	53 (R/W)	260	Integer
F14	Fan with high condensing temperature when starting	U	0	999	-	1	0	FN	91 (R/W)	298	Integer
F15	Low noise activation 0= deactivated 1= activated in cooling 2= activated in heating 3= activated in cooling and heating	U	0	3	-	1	0	F	85 (R/W)	292	Integer
F16	Low noise diff. in cooling	F	0	500	°C/°F/ bar	0.1	0	L	35 (R/W)	35	Analog
F17	Low noise diff. in heating	F	0	500	°C/°F/ bar	0.1	0	L	36 (R/W)	36	Analog

Table 4.g

4.3.8 Unit setting parameters (H*)

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	def.	visibility	supervis. variable	Modbus	variable type
H01	Unit model 0= air_air unit 1= air_air heat pump 2= air_water chiller 3= air_water heat pump 4= water_water chiller 5= water_water heat pump with reversal on gas circuit 6= water_water heat pump with reversal on water circuit 7= condensing unit 8= reverse-cycle condensing unit 9= water-cooled condensing unit 10= reverse-cycle water-cooled condensing unit 11= cooling only air-air unit with electric heaters	F	0	11	Flag	1	2	-	54 (R/W)	261	Integer
H02	Number of condensers 0=1 circuit 1=2 circuits	U	0	1	Flag	1	0	F	12 (R/W)	12	Digital
H03	Number of evaporators 0=1 evaporator 1=2 evaporators	F	0	1	Flag	1	0	-	13 (R/W)	13	Digital
H04	Number of compressors per circuit 0=1 comp. ON 1 circuit (single circuit) 1=2 comp. in tandem ON 1 circuit (single circuit) 2=1 comp. per circuit, 2 circuits (two circuits) 3=2 comp. in Tandem, 2 circuits (two circuits) 4=1 compressor and 1 Capacity step in one circuit 5=1 compressor and 1 capacity Step per circuit	F	0	5	Flag	1	0	-	55 (R/W)	262	Integer
H05	Pump/outlet fan (Air/Air) mode (output N2) 0= absent 1= always ON 2= ON upon request of the controller 3= ON upon request of the controller and for set time 4= follow hot keep or hot start in heating, always on in cooling 5= follow hot keep or hot start in heating, follow the comp. in cooling	F	0	5	Flag	1	1	-	56 (R/W)	263	Integer
H06	Cooling/Heating digital input 0= absent 1= present	U	0	1	Flag	1	0	-	14 (R/W)	14	Digital
H07	ON/OFF digital input 0= absent 1= present	U	0	1	Flag	1	0	-	15 (R/W)	15	Digital
H08	µC²SE network configuration 0= µC²SE only 1= µC²SE + valve 2= µC²SE + exp. 3= µC2SE + exp. + valve1 + valve2 4= µC2SE + exp. + valve1	F	0	3	Flag	1	0	-	57 (R/W)	264	Integer
H09	Lock keypad 0= disabled 1= enabled	U	0	1	Flag	1	1	-	16 (R/W)	16	Digital
H10	Serial address 0= future use as terminal	U	1	200	-	-	1	-	58 (R/W)	265	Integer
H11	Output modes (see pag. 46)	F	0	12	Int	1	0	-	59 (R/W)	266	Integer
H12	Capacity-control and reversing valve logic 0= Both normally closed 1= Both normally open 2= Inversion valve normally open and capacity-control valve normally closed 3= Inversion valve normally closed and capacity-control valve normally open	F	0	3	Flag	1	1	-	60 (R/W)	267	Integer
H13	Activate pump down	F	0	1	-	1	0	V	17 (R/W)	17	Digital
H14	Minimum pump down pressure	F	0	500	Dbar	0.1	20	M	37(R/W)	37	Analog
H15	Maximum pump down time	F	0	180	s	1	30	M	61 (R/W)	268	Integer
H16	Activate autotuning	F	0	1	Flag	1	0	-	22 (R/W)	22	Digital
H17	Minimum DTE value allowed	F	0.0	1760	°C/°F	0.1	0	-	68 (R/W)	68	Analog
H18	Maximum DTE value allowed	F	0.0	1760	°C/°F	0.1	800	-	69 (R/W)	69	Analog
H19	Maximum DTC value allowed	F	0.0	1760	°C/°F	0.1	800	-	70 (R/W)	70	Analog
H21	Second pump function 0= Disabled 1= Backup and weekly rotation 2= Backup and daily rotation 3= Condensing control on corresponding set point 4= Condensing control always on	F	0	4	int	1	0	-	62 (R/W)	269	Integer
H22	Disable load default values 0= Function disabled 1= Function enabled	F	0	1	Flag	1	0	-	18 (R/W)	18	Digital
H23	Enable Modbus®	F	0	1	Flag	1	0	-	11 (R/W)	11	Digital

Table 4.h

4.3.9 Firmware parameters (F-r*)

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	default	visibility	supervis. variable	Modbus	variable type
H99	Software version, Driver 2	D	0	999	Int	-	22	-	1 (R)	208	Integer
H98	Software version, Driver 1	D	0	999	Int	-	0	X	2 (R)	209	Integer
H97	Expansion software version	D	0	999	Int	-	0	V	3 (R)	210	Integer
H96	Software version (displayed when powering up the instrument)	D	0	999	Int	-	0	XV	4 (R)	211	Integer

Table 4.i

4.3.10 Alarm setting parameters (P*)

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	def.	visibility	supervis. variable	Modbus	variable type
P01	Flow switch alarm delay when starting the pump	U	0	150	s	1	20	-	63 (R/W)	270	Integer
P02	Flow switch alarm delay during steady operation	U	0	120	s	1	5	-	64 (R/W)	271	Integer
P03	Low pressure alarm delay at compressor start-up	U	0	200	s	1	40	-	65 (R/W)	272	Integer
P04	Enable compressor capacity-control with high pressure 0= capacity control deactivated 1= capacity-control with high pressure active 2= capacity-control with low pressure active 3= capacity-control with high and low pressure active	U	0	3	Flag	1	0	P	66 (R/W)	273	Integer
P05	Alarm reset 0= HP1-2/LP1-2/A1-2/Lt manual 1= HP1-2/LP1-2/A1-2/Lt automatic 2= HP1-2/A1-2/Lt manual LP1-2 automatic 3= HP1-2 manual LP1-2/A1-2/Lt automatic 4= HP1-2/LP1-2 manual A1-2/Lt automatic 5= HP1-2/LP1-2 (thrice per hour) manual A1-2/Lt automatic 6= HP1-2/LP1-2 (thrice per hour) manual; A1-2/Lt manual	F	0	6	Flag	1	0	-	67 (R/W)	274	Integer
P06	Cooling/heating logic 0=: ❄ Chiller, ❄: Heat pump 1=: ❄ Heat pump, ❄: Chiller	F	0	1	Flag	1	0	-	19 (R/W)	19	Digital
P07	Low pressure alarm with pressure probe 0= Disabled 1= Enabled	F	0	1	Flag	1	0	P	68 (R/W)	275	Integer
P08	Digital input 1 selection 0= N / 1=FL man. / 2=FL auto. / 3=TP man. 4=TP auto / 5= TC1 man. / 6= TC1 auto. / 7= TC2 man. 8= TC2 auto. / 9= Cool/heat / 10= Cool/heat with delay / 11= LA man. 12= LA auto. / 13= 2° Set / 14= 2° Set timer / 15= stop defrost c.1 16= stop defrost c.2 / 17= start defrost c.1 / 18= start defrost c.2 / 19= step 1 20 = step 2 / 21= step 3 / 22= step 4 / 23= remote ON/OFF 24=Comp. alarm1 / 25=Comp. alarm2 / 26=Comp. alarm3 / 27=Comp. alarm4	F	0	23	Int	1	0	-	69 (R/W)	276	Integer
P09	Digital input 2 selection	F	0	27	Int	1	0	-	70 (R/W)	277	Integer
P10	Digital input 6 selection	F	0	27	Int	1	0	X	71 (R/W)	278	Integer
P11	Digital input 7 selection	F	0	27	Int	1	0	X	72 (R/W)	279	Integer
P12	Digital input 10 selection	F	0	27	Int	1	0	X	73 (R/W)	280	Integer
P13	Configuration of B4 as P8 if /4=1 (digital input)	F	0	27	Int	1	0	-	74 (R/W)	281	Integer
P14	Configuration of B8 as /8=1 (digital input)	F	0	27	Int	1	0	X	75 (R/W)	282	Integer
P15	Select low pressure alarm 0= not active with compressor OFF 1= active with compressor OFF	F	0	1	Flag	1	0	-	76 (R/W)	283	Integer
P16	High temperature alarm set	U	-400	1760	°C/°F	0.1	800	-	38 (R/W)	38	Analog
P17	High temperature alarm delay at start-up	U	0	250	s	1	30	-	77 (R/W)	284	Integer
P18	High pressure alarm set from transducer	F	P33	999	Dbar	0.1	200	P	39 (R/W)	39	Analog
P19	System low temperature alarm set point	U	-400	1760	°C/°F	0.1	100	-	40 (R/W)	40	Analog
P20	Enable system start-up protection 0= Disabled 1= Enabled	U	0	1	Flag	1	0	-	20 (R/W)	20	Digital
P21	Alarm relay output logic 0= normally de-activated 1= normally activated	F	0	1	-	1	0	-	8 (R/W)	8	Digital
P22	Low pressure alarm delay at start-up Compressor in heat pump	U	0	200	s	1	40	-	86 (R/W)	293	Integer
P23	Low pressure alarm delay at compressor start-up in defrost	U	0	999	s	1	40	-	87 (R/W)	294	Integer
P24	Deactivate compressors with HP and LP capacity-control	D	0	1	-	1	0	P	21 (R/W)	21	Digital
P25	Select digital output 2	F	0	17	Int	1	0	-	108 (R/W)	315	Integer
P26	Select digital output 3	F	0	17	Int	1	0	-	109 (R/W)	316	Integer
P27	Select digital output 4	F	0	17	Int	1	0	-	110 (R/W)	317	Integer
P28	Select digital output 5	F	0	17	Int	1	0	-	111 (R/W)	318	Integer
P29	Select digital output 7	F	0	17	Int	1	0	X	112 (R/W)	319	Integer
P30	Select digital output 8	F	0	17	Int	1	0	X	113 (R/W)	320	Integer
P31	Select digital output 9	F	0	17	Int	1	0	X	114 (R/W)	321	Integer
P32	Select digital output 10	F	0	17	Int	1	0	X	115 (R/W)	322	Integer
P33	Low pressure alarm threshold	F	0	P18	Dbar	0.1	10	P	76 (R/W)	76	Analog
P34	Select digital input 5	F	0	23	Int	1	23	-	122 (R/W)	329	Integer
P35	Mute alarm with "mute" button 0= no 1= yes	F	0	1	-	1	0	-	23 (R/W)	23	Digital
P36	Type of high pressure alarm management 0= always 1= only if compressor active and 2 s after activation	F	0	1	-	1	0	-	24 (R/W)	24	Digital

Table 4.j

4.3.11 Control setting parameters (r*)

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	def.	visibility	supervis. variable	Modbus	variable type
r01	Cooling set point	D	r13	r14	°C/°F	0.1	12.0	-	41 (R/W)	41	Analog
r02	Cooling differential	D	3	500	°C/°F	0.1	30	-	42 (R/W)	42	Analog
r03	Heating set point	D	r15	r16	°C/°F	0.1	400	-	43 (R/W)	43	Analog
r04	Heating differential	D	3	500	°C/°F	0.1	30	-	44 (R/W)	44	Analog
r05	Compressor rotation 0= disabled; 1= FIFO type 2= hour control 3= direct relation between (D.I. and compressors D.O.)	F	0	3	Flag	1	0	-	78 (R/W)	285	Integer
r06	Type of compressor control 0= proportional on inlet 1= proportional on inlet + dead zone 2= proportional on outlet 3= proportional on outlet + dead zone 4= time on outlet with dead zone	F	0	4	Flag	1	0	-	79 (R/W)	286	Integer
r07	Dead zone differential	F	1	500	°C/°F	0.1	20	-	45 (R/W)	45	Analog
r08	Maximum control output activation time	F	0	999	s	1	120	-	80 (R/W)	287	Integer
r09	Minimum control output activation time	F	0	999	s	1	100	-	81 (R/W)	288	Integer
r10	Maximum control output deactivation time	F	0	999	s	1	120	-	82 (R/W)	289	Integer
r11	Minimum control output deactivation time	F	0	999	s	1	100	-	83 (R/W)	290	Integer
r12	Compressor deactivation differential	F	0	500	°C/°F	0.1	20	-	46 (R/W)	46	Analog
r13	Minimum set point in Cooling	U	-400	r14	°C/°F	0.1	-400	-	47 (R/W)	47	Analog
r14	Max. Cooling set point	U	r13	1760	°C/°F	0.1	800	-	48 (R/W)	48	Analog
r15	Min. Heating set point	U	-400	r16	°C/°F	0.1	-400	-	49 (R/W)	49	Analog
r16	Max. Heating set point	U	r15	1760	°C/°F	0.1	800	-	50 (R/W)	50	Analog
r17	Cooling compensation constant	U	-50	50	-	0.1	0	-	51 (R/W)	51	Analog
r18	Maximum distance from the set point	U	3	200	°C/°F	0.1	3	-	52 (R/W)	52	Analog
r19	Start compensation temperature in cooling mode	U	-400	1760	°C/°F	0.1	300	-	53 (R/W)	53	Analog
r20	Start compensation temperature in heating mode	U	-400	1760	°C/°F	0.1	0	-	54 (R/W)	54	Analog
r21	Second cooling set point from external contact	D	r13	r14	°C/°F	0.1	120	-	55 (R/W)	55	Analog
r22	Second heating set point from external contact	D	r15	r16	°C/°F	0.1	400	-	56 (R/W)	56	Analog
r23	Select automatic changeover probe	D	0	8	Flag	1	0	-	84 (R/W)	291	Integer
r24	Automatic changeover set point	D	r15	r16	°C/°F	0.1	400	-	61(R/W)	61	Analog
r25	Outside temp set point to stop compressors	D	-400	800	°C/°F	0.1	-400	-	65 (R/W)	65	Analog
r26	Cooling set point in dehumidification	D	r13	r14	°C/°F	0.1	120	-	66 (R/W)	66	Analog
r27	Enable accumulation vessel suppression 0= Disabled 1= Enabled in cool 2= Enabled in Heat 3= Always enabled	F	0	3	Flag	1	0	-	88 (R/W)	295	Integer
r28	Min. compressor running time for low load/damper travel time	F	0	999	s	1	60	-	89 (R/W)	296	Integer
r29	Chiller low load differential/freecooling differential	F	10	500	°C/°F	0.1	30	-	58 (R/W)	58	Analog
r30	Heat pump low load differential/freeheating differential	F	10	500	°C/°F	0.1	30	-	59 (R/W)	59	Analog
r31	Heating compensation constant	U	-50	50	-	0.1	0	-	60 (R/W)	60	Analog
r32	Hot Start set point	D	r15	r16	°C/°F	0.1	120	-	71(R/W)	71	Analog
r33	Hot Start differential	F	3	500	°C/°F	0.1	30	-	72 (R/W)	72	Analog
r34	Enable Freecooling/Freeheating 0= disabled 1= freecooling / without compressors / cooling only 2= freecooling / with compressors / cooling only 3= freeheating / without compressors / heating only 4= freeheating / with compressors / heating only 5= freecooling and freeheating / without compressors / freecooling cooling only and freeheating heating only 6= freecooling and freeheating / with compressors / freecooling cooling only and freeheating heating only 7= freecooling / without compressors / always 8= freecooling / with compressors / always 9= freeheating / without compressors / always 10= freeheating / with compressors / always 11= freecooling and freeheating / without compressors / always 12= freecooling and freeheating / with compressors / always	F	0	12	Flag	1	0	-	116 (R/W)	323	Integer
r35	Compressor deactivation time with freecooling/freeheating active	F	0	999	s	1	240	-	117 (R/W)	324	Integer
r36	Maximum damper operating time	F	0	600	s	1	20	-	118 (R/W)	325	Integer
r37	Damper opening duty cycle differential	F	03	500	°C/°F	0.1	30	-	73 (R/W)	73	Analog
r38	Damper closing duty cycle differential	F	03	500	°C/°F	0.1	30	-	74 (R/W)	74	Analog
r39	Autotuning correction coefficient	F	11	30	-	0.1	13	-	75 (R/W)	75	Analog
r40	Indicates when to operate minimum damper opening 0= never 1= only in freecooling 2= only in freeheating 3= in freecooling and in freeheating 4= only if the freecooling and freeheating conditions end 5= only if the freeheating conditions are not present 6= only if the freecooling conditions are not present 7= always	F	0	7	-	1	0	-	119 (R/W)	326	Integer
r41	Minimum damper opening	F	0	100	%	1	0	-	120 (R/W)	327	Integer
r42	Freecooling operating threshold with compressors disabled.	U	A07	1760	°C/°F	0.1	50	-	81 (R/W)	81	Analog
r43	Heater set point 0= A4, A8 and A11 absolute values 1= A4 absolute value, A8 and A11 values relative to the set point 2= A4 value relative to the set point, A8 and A11 absolute values 3= A4, A8 and A11 values relative to the set point	F	0	3	-	1	0	-	121 (R/W)	328	Integer
r44	Inactivity time in Freecooling control	F	0	240	-	1	5	-	123 (R/W)	330	Integer

Table 4.k

4.3.12 Timer setting parameters (t*)

display indicat.	parameter and description	default level	min.	max.	U.M.	variat.	def.	visibility	supervis. variable	Modbus	variabile type
t01	RTC hours	U	0	23	h	1	0	W	129(R/W)	336	Integer
t02	RTC minutes	U	0	59	min	1	0	W	130 (R/W)	337	Integer
t03	RTC day	U	1	31	g	1	1	W	131 (R/W)	338	Integer
t04	RTC month	U	1	12	mesi	1	1	W	132 (R/W)	339	Integer
t05	RTC year	U	0	99	anni	1	6	W	133 (R/W)	340	Integer
t06	Start hours for 2nd set point in cooling	U	0	23	h	1	0	W	92 (R/W)	299	Integer
t07	Start minutes for 2nd set point in cooling	U	0	59	min	1	0	W	93 (R/W)	300	Integer
t08	End hours for 2nd set point in cooling	U	0	23	h	1	0	W	94 (R/W)	301	Integer
t09	End minutes for 2nd set point in cooling	U	0	59	min	1	0	W	95 (R/W)	302	Integer
t10	Start hours for 2nd set point in heating	U	0	23	h	1	0	W	9 (R/W)	303	Integer
t11	Start minutes for 2nd set point in heating	U	0	59	min	1	0	W	97 (R/W)	304	Integer
t12	End hours for 2nd set point in heating	U	0	23	h	1	0	W	98 (R/W)	305	Integer
t13	End minutes for 2nd set point in heating	U	0	59	min	1	0	W	99 (R/W)	306	Integer
t14	Start hours for 2nd low-noise in cooling	U	0	23	h	1	23	W	100 (R/W)	307	Integer
t15	Start minutes for 2nd low-noise in cooling	U	0	59	min	1	0	W	101 (R/W)	308	Integer
t16	End hours for 2nd low-noise in cooling	U	0	23	h	1	7	W	102 (R/W)	309	Integer
t17	End minutes for 2nd low-noise in cooling	U	0	59	min	1	0	W	103 (R/W)	310	Integer
t18	Start hours for 2nd low-noise in heating	U	0	23	h	1	23	W	104 (R/W)	311	Integer
t19	Start minutes for 2nd low-noise in heating	U	0	59	min	1	0	W	105 (R/W)	312	Integer
t20	End hours for 2nd low-noise in heating	U	0	23	h	1	7	W	106 (R/W)	313	Integer
t21	End minutes for 2nd low-noise in heating	U	0	59	min	1	0	W	107 (R/W)	314	Integer

Table 4.I

4.3.13 Supervisor-only variables

display indicat.	parameter and description	default level	min.	max.	U.O.M	variat.	def.	visibility	supervis. variable	Modbus	variable type
-	Circuit 1 alarm	D	0	1		-	0		41 (R)	41	Digital
-	Circuit 2 alarm	D	0	1		-	0		42 (R)	42	Digital
-	EVD valve 1 alarm	D	0	1		-	0		43 (R)	43	Digital
-	EVD valve 2 alarm	D	0	1		-	0		44 (R)	44	Digital
-	General alarm	D	0	1		-	0		45 (R)	45	Digital
-	Probe alarm	D	0	1		-	0		46 (R)	46	Digital
-	Compressor warning	D	0	1		-	0		47 (R)	47	Digital
-	Compressor error alarm	D	0	1		-	0		25 (R)	25	Digital
-	EVD 1 warning	D	0	1		-	0		48 (R)	48	Digital
-	EVD 2 warning	D	0	1		-	0		49 (R)	49	Digital
-	General warning	D	0	1		-	0		50 (R)	50	Digital
-	Temperature warning	D	0	1		-	0		51 (R)	51	Digital
-	Fan warning	D	0	1		-	0		52 (R)	52	Digital
-	DTE/DTC alarm	D	0	1		-	0		77 (R)	77	Digital
-	Digital input 1	D	0	1		-	0		53 (R)	53	Digital
-	Digital input 2	D	0	1		-	0		54 (R)	54	Digital
-	Digital input 3	D	0	1		-	0		55 (R)	55	Digital
-	Digital input 4	D	0	1		-	0		56 (R)	56	Digital
-	Digital input 5	D	0	1		-	0		57 (R)	57	Digital
-	Digital input B4	D	0	1		-	0		58 (R)	58	Digital
-	Digital input 1	D	0	1		1	0		59 (R/W)	59	Digital
-	Digital input 2	D	0	1		1	0		60 (R/W)	60	Digital
-	Digital input 3	D	0	1		1	0		61 (R/W)	61	Digital
-	Digital input 4	D	0	1		1	0		62 (R/W)	62	Digital
-	Digital input 5	D	0	1		1	0		63 (R/W)	63	Digital
-	Standby/On status 0= Standby 1= On	D	0	1		1	0		64 (R/W)	64	Digital
-	Heating/Cooling status: 0= Heating 1= Cooling	D	0	1		1	1		65 (R/W)	65	Digital
-	Gain constant for probe 1 calibration	F	0	8000		-	1000		5 (R)	212	Integer
-	Gain constant for probe 2 calibration	F	0	8000		-	1000		6 (R)	213	Integer
-	Gain constant for probe 3 calibration	F	0	8000		-	1000		7 (R)	214	Integer
-	Gain constant for probe 4 calibration	F	0	8000		-	1000		8 (R)	215	Integer
-	Offset constant for probe 1 calibration	F	-8000	8000		-	0		9 (R)	216	Integer
-	Offset constant for probe 2 calibration	F	-8000	8000		-	0		10 (R)	217	Integer
-	Offset constant for probe 3 calibration	F	-8000	8000		-	0		11 (R)	218	Integer
-	Offset constant for probe 4 calibration	F	-8000	8000		-	0		12 (R)	219	Integer
	Digital input 6	D	0	1		-	0		66 (R)	66	Digital
-	Digital input 7	D	0	1		-	0		67 (R)	67	Digital
-	Digital input 8	D	0	1		-	0		68 (R)	68	Digital
-	Digital input 9	D	0	1		-	0		69 (R)	69	Digital
-	Digital input 10	D	0	1		-	0		70 (R)	70	Digital
-	Digital input B8	D	0	1		-	0		71 (R)	71	Digital
-	Digital output 6	D	0	1		1	0		72 (R/W)	72	Digital
-	Digital output 7	D	0	1		1	0		73 (R/W)	73	Digital
-	Digital output 8	D	0	1		1	0		74 (R/W)	74	Digital
-	Digital output 9	D	0	1		1	0		75 (R/W)	75	Digital
-	Digital output 10	D	0	1		1	0		76 (R/W)	76	Digital
-	Password to control outputs from the supervisor	D	0	8000		1	0		13 (R/W)	220	Integer
- - - - -	Defrost status bit 0= Defrost circuit 1 bit 1= Defrost circuit 2 bit 2= Fan Defrost circuit 1 bit 3= Fan Defrost circuit 2	D	0	255		-	0		134 (R)	341	Integer

-	Controls from the UAD: bit0= terminal status (0= not connected; 1= available) bit2; bit1= mode set from µAD (00= AUTO; 01= cooling; 10= heating) bit3= enable dehumidification bit4= enable humidification bit5= terminal probe alarm bit6= activate boiler output bit7= 0= process mode active; 1= process mode disabled	D	0	1023		1	0		135 (R/W)	342	Integer
-	Signals to the µAD bit0= cool/heat request from uAD in progress bit1= cool/heat request accepted from µAD (1= cooling; 0= heating) bit2= start fans bit3= alarm active on µCH bit4= RTC available on µCH2 SE	D	0	255		-	0		136 (R)	343	Integer
-	DTE value saved in EEPROM	D	0	0		-	0		98 (R)	98	Analog
-	Internal set point compensated in the event of autotuning	D	0	0		-	0		97 (R)	97	Analog
-	Ambient set point (from µAD)	D	-400	1760		0,1	0		95 (R/W)	95	Analog
-	Set point variation from µAM (µedronic)	D	-100	100		0,1	0		96 (R/W)	96	Analog
-	Differential for the ambient set point	D	-100	100		0,1	0		94 (R/W)	94	Analog
-	Controls by the µAD from save	D	0	32767		1	0	-	137 (R/W)	344	Integer
-	"Active alarm signal: bit0= probe alarm (E1,E2,E,E4,E5,E6,E7,E8) bit1= high pressure alarm (HP1, HP2) bit2= low pressure alarm (LP1, LP2) bit3= flow switch alarm (FL) bit4= expansion communication alarm (ESP) bit5= EE2PROM alarm (EPB) bit6= antifreeze alarm (A1, A2) bit7= thermal overload alarm (TP, TP1, TP2) bit8= hour counter alarm (H1, H2, H, H4)"	D	0	32767		1	0	-	128 (R/W)	335	Integer
-	Terminal humidity probe (per terminal µAD)	D	0	1000	%	0,1	0		129 (R/W)	129	Analog
-	Reset alarms	D	0	1		1	0		78 (R/W)	78	Digital
-	Digital input B	D	0	1		-	0		79 (R)	79	Digital

Table 4.m

4.3.13 Supervisor-only variables

display indicat.	parameter and description	default level	min.	max.	U.O.M.	variat.	def.	visibility	supervis. variable	Modbus	variable type
-	Indicates the unit parameter (Carel SV communication)	F	0	250		-	108		(R)	207	Integer
-	Gain constant for pressure probe calibration	F	0	16000		-	1000		(R)	207	Integer
-	Offset constant for pressure probe calibration	F	-8000	8000		-	0		(R)	207	Integer
-	Compressor 1 operating hours	D	0	8000		-	0		(R)	207	Integer
-	Compressor 2 operating hours	D	0	8000		-	0		(R)	207	Integer
-	Compressor 3 operating hours	D	0	8000		-	0		(R)	207	Integer
-	Compressor 4 operating hours	D	0	8000		-	0		(R)	207	Integer
-	Compressor pump operating hours	D	0	8000		-	0		(R)	207	Integer
-	Evaporator pump operating hours	D	0	8000		-	0		(R)	207	Integer
-	Alarms/warnings for EVD1: bit0= low superheat alarm bit1= EEPROM alarm bit2= probe alarm bit3= MOP warning bit4= LOP warning bit5= high suction temperature warning bit6= valve open after power failure alarm bit7= flat battery alarm	D	0	0		-	0		(R)	207	Integer
-	Controls/status indicators for EVD1: bit0; bit1= comp. load step (0= 0%; 1= 50%; 2= 100%) bit2= standby circuit 2 (0= ON; 1= standby) bit3= chiller/pump circuit 2 (0= chiller; 1= pump) bit4= defrost circuit 2 (0= no defrost; 1= defrost) bit5= forced valve closing (for pump down) bit6= enable smart defrost bit7= enable low noise bit8= type of condenser probe (0= temp/1= press) bit9= condenser temp/press probe available bit10= restart unit after valve open alarm (set in reset_ alarms) bit11= enable control for driver 2	D	0	0		-	0		(R)	207	Integer
-	Communication of the logical status of the digital outputs to expansion: bit0= compressor bit1= compressor 4 bit2= heater 2 bit3= reversing valve bit4= warning bit5= condenser pump bit6= fans in alarm status bit7= fan status in alarm (ON= 1; oFF= 0) bit8= speed to be set (100%= 1; speed from probe= 0) bit9= indicates fans 2 for defrost circuit 2 bit10= heater 1 bit11= open damper bit12= close damper bit13= humidifier	D	0	4200		-	0		(R)	207	Integer

-	Signals from the expansion board: bit0= probe alarm 5 bit1= probe alarm 6 bit2= probe alarm 7 bit3= probe alarm 8 bit4= zero crossing alarm circuit 2 bit5= tLan alarm valve 2 bit6= fans on signal (symbol on) bit7= fan symbol flashing circuit 2 bit8= max fan speed circuit 2	D	0	0		-	0		(R)	207	Integer
-	Signals to the expansion board: bit0= temporary season (internal) cool= 1; heat= 0; bit1= frozen season (same as SV) bit2= temporary status (1)/stand_by (0) bit3= frozen status (1)/stand_by (0) bit4= low voltage alarm bit5= high voltage alarm bit6= enable control for expansion bit7= enable low_noise in cooling bit8= enable low_noise in heating bit9= boiler bit12= digital signature for µChiller (to the expansion)	D	0	0		-	0		(R)	207	Integer
-	Alarms/warnings for EVD2: bit0= low superheat alarm bit1= EEPROM alarm bit2= probe alarm bit3= MOP warning bit4= LOP warning bit5= high suction temperature warning bit6= valve open after power failure alarm bit7= flat battery alarm	D	0	0		-	0		(R)	207	Integer
-	Controls/status indicators for EVD2: bit0; bit1= compressor load step (0= 0%; 1= 50%; 2= 100%) bit2= standby circuit 2 (0= ON; 1= standby) bit3= chiller/pump circuit 2 (0= chiller; 1 = pump) bit4= defrost circuit 2 (0= no defrost; 1= defrost) bit5= forced valve closing (for pump down) bit6= enable smart defrost bit7= enable low noise bit8= type of condenser probe (0= temp/1= press) bit9= condenser temp/press probe available bit10= restart unit after valve open alarm (set in reset_ alarms) bit11= enable control for driver 2	D	0	0		-	0		(R)	207	Integer
-	Model of unit 0= air-air unit 1= air-air heat pump 2= air-water chiller 3= air-water heat pump 4= water-water chiller 5= water-water heat pump, reversal of gas circ. 6= water-water heat pump, reversal of water circ. 7= condenser 8= condenser with reverse cycle 9= water-cooled condenser 10= water-cooled condenser with reverse cycle	D	0	10	flag	1	2		(R/W)	207	Integer

Table 4.n

5. DESCRIPTION OF THE PARAMETERS

To modify the parameters, see chapter 4 "Parameters."

- **Probe settings: parameters (/*)** (see Table 4.a)
  - Type of probe: from /01 to /08: enables the reading of the corresponding analogue input or sets the function

- **Functions of the probes**

Type of unit Parameter H01		Temp. control probe 1st circuit	Antifreeze probe 1st circuit	Cond. temp. probe	Press probe 1st circuit 2nd evaporator	Antifreeze probe 2nd circuit	Cond. temp. probe	Press. probe 2nd circuit
0=	air/air	B1	B2 (low outlet temperature)	B3	B4	Not used	B7	B8
1=	air/air heat pump (cooling/heating)	B1	B2 (low outlet temperature)	B3	B4	Not used	B7	B8
2=	air/water Chiller	B1/B2 single circuit (B1/B5 two circuits)	B2	B3	B4	B6	B7	B8
3=	air/water heat pump (cooling/heating)	B1/B2 single circuit (B1/B5 two circuits)	B2	B3	B4	B6	B7	B8
4=	water/water Chiller	B1/B2 single circuit (B1/B5 two circuits)	B2	Not used	Not used	B6	Not used	Not used
5=	water/water heat pump rev. on gas cooling	B1/B2 single circuit (B1/B5 two circuits)	B2	B3	B4	B6	B7	B8
	heating	B1/B2 single circuit (B1/B5 two circuits)	B3	B3	B4	B7	B7	B8
6=	water/water heat pump rev. on H_2O cooling	B1/B2 single circuit (B1/B5 two circuits)	B2	Not used	B4	B6	Not used	B8
	heating	B3	B2	Not used	B4	B6	Not used	B8
7=	Air-cooled condensing unit	-	-	B3	B4	-	B7	B8
8=	Air-cooled condensing unit rev. on gas	-	-	B3	B4	-	B7	B8
9=	Water-cooled condensing unit	-	-	B3	B4	-	B7	B8
10=	Water-cooled condensing unit rev. on gas	-	B3	B3	B4	B7	B7	B8
11=	Cooling-only air-air unit with electric heating	B1	B2 (low outlet temperature)	B3	B4	Not used	B7	B8

Table 5.a

- Min/max voltage and pressure values

From /09 to /12: sets the minimum/maximum voltage and pressure for the ratiometric signal.

- Probe calibration

From /13 to /20: calibrates the corresponding sensor (from B1 to B8).

- Digital filter

/21: Establishes the coefficient used in the digital filtering of the value measured. High values for this parameter will eliminate any continuous disturbance at the analogue inputs (however decrease the promptness of measurement). The recommended value is 4 (default).

- Input limit

/22: Establishes the maximum variation that can be measured by the probes in one unit program cycle; in practice, the maximum variations allowed in the measurement are between 0. 1 and 1.5 units (bars, °C or °F, depending on the probe and the unit of measure) approximately every one second. Low values for this parameter will limit the effect of impulsive disturbance. Recommended value 8 (default).

- Unit of measure

/23: Selects the unit of measure as degrees centigrade or Fahrenheit. When the parameter is modified, the μC^2SE automatically converts the values read by the NTC temperature probes B1, B2, B3 into the new unit of measure; while all the other parameters set (set point, differential etc.) remain unchanged.

- **Antifreeze, auxiliary heater: parameters (A*)**
- Antifreeze alarm set point/outlet limit (low ambient temp. for air/air units)

A01: when probe B2 is installed on the coil represents the temperature (antifreeze set point) of the water at the evaporator outlet below which an antifreeze alarm is activated; in this condition the compressors corresponding to the circuit in question are stopped, while the pump remains on to decrease the possibility of freezing. The alarm is reset manually (or automatically, depending on parameter P05) only when the water temperature returns within the operating limits (that is, above A01+A02).
In the Air/Air units (H1=0,1) the value represents the low room temperature warning threshold; this alarm, activated according to value read by probe B1 or B2 (depending on parameter A06) is signal only, and is reset depending on the value of P05.

If probe B2 is placed in the outlet air flow (air/air units), A01 becomes the outlet limit, and if the outlet probe reading (B2) < outlet limit (A1) then:

1. bypass waiting time A3;
2. stop the compressors; if already off go to pt. 4;
3. bypass waiting time A3;
4. close damper with 50% duty cycle if FC active and the ambient temperature means damper open or dead zone. If FC is not active go to pt. 6;
5. bypass waiting time A3 after having closed r28 twice (from the end of the last period);
6. If B2 < A1 the alarm "A1" is activated. The alarm reset depends on P5.

Example of antifreeze/outlet limit management

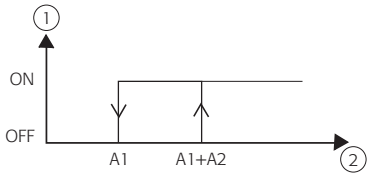


Fig. 5.a.a

Key:
1. freecooling or comp
2. probe B2

CAREL NTC probe (mode H1= 2, 3, 4, 5 and 6)

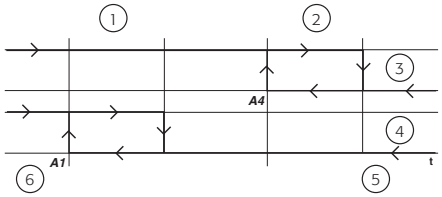


Fig. 5.a.b

- Antifreeze/low room temperature (air/air) alarm differential

A02: This represents the differential for the activation of the antifreeze alarm (low room temperature in air/air units); the alarm condition cannot be reset until the temperature exceeds the set point + differential (A01+A02 or A14+A02).

- Antifreeze alarm bypass time low room temperature from unit start in heating mode

A03: This represents the delay in the activation of the antifreeze alarm when starting the system. In the case of air/air units, this parameter represents the delay time for the low room temperature (return-intake air) signal, only in heating mode. This means that the room being heated is too cold (threshold set by the user).

- Antifreeze heater/auxiliary heater set point in cooling

A04: Determines the threshold below which the antifreeze heater is switched on. In the air/air units (H01=0, 1) this parameter represents the temperature value below which the auxiliary heater is activated. This temperature is compensated according to the following equation:
Set_heaters (cooling)= A04+(Compensated set point – Set point set)
In the air/air heat pumps (H01=1) the auxiliary heaters are not used in cooling mode.

N.B. The antifreeze set points are not compensated.

- Antifreeze heater/auxiliary heater differential

A05: Differential for the activation and deactivation of the antifreeze heaters (auxiliary heaters in air/air units).

Operating diagram of the antifreeze alarm and the antifreeze heaters for air/water and water/water chillers and heat pumps.

Key:
1. antifreeze alarm differen. (A2)
2. antifreeze heater differen (A5)
3. heaters
4. antifreeze alarm
5. antifreeze heater set point (A4)
6. antifreeze alarm set point (A1)

- Auxiliary heater probe in heating

A06: This determines which probe is used for control the auxiliary heater. The meaning of the parameter is the following:
A06 = 0 => Control probe see Table 5.a.a
A06 = 1 => Antifreeze probe see Table 5.a.a
If H1=1 the heaters are disabled in cooling mode. See Functions of the probes.
Not valid if A10= 2

- Antifreeze alarm set point limit

A07: Establishes the minimum limit for setting the antifreeze alarm set point (A01).

- Antifreeze heater in defrost/auxiliary heater in heating set point

A08: Represents the threshold below which the auxiliary heater is ON in defrost and in heating mode.
The set point in heating is compensated according to the following equation:
Set_heaters (heating) = A08+(Compensated set point – Set point set)
The antifreeze set point is not compensated.
In the heat pumps (H01=1-3-6), during heating mode, it represents the set point for the auxiliary heater; during the defrost cycle, it represents the set point for the activation of the antifreeze heaters. In the air/air units (H01=0) it only represents the set point for the heating heaters.
In heat pump mode (H1=5-10) this represents the set point for the antifreeze heater and the antifreeze probe becomes B3/B7

- Antifreeze heater/auxiliary heater differential in heating

A09: Represents the differential for the activation/deactivation of the antifreeze heater in defrost/auxiliary heater in heating. The differential is the same for both heaters.

- Automatic start for antifreeze

A10: This parameter is valid when the unit is in standby.
The operating mode switchover delay times are ignored.
A10=0: function not enabled
A10=1: Auxiliary heater and pump are ON at the same time, based to the respective set: points, A04 or A08, according to the settings of the antifreeze or auxiliary heaters; the exception is when H01=1 in cooling, in which case not even the pump will be activated. Each circuit, in the case of two evaporators, will be controlled based on its own probe (B2, B6).
A10=2: pump and auxiliary heater ON independently based on the respective set point, A04 or A08. If the temperature falls below the antifreeze alarm set point A01, the unit is started in heating mode, controlling the steps (compressors) based on the set point A01 and differential A02, in proportional mode. Each circuit, when there are 2 evaporators, will be controlled using its own probe (B2, B6). A10=2: pump and support heaters activated together, based on the set point A04. If there is an alarm in both circuits, control will be performed on the based on the lower of the two. This mode ends automatically when the antifreeze set point A01 + the differential A02 is reached (returning to the previous mode); in any case, the function can be terminated manually by modifying the parameters or disconnecting the power supply to the device.

In this case, the display will be as follows:
- operating mode LED OFF;
- cooling heating flag not switched (not detected by the supervisor);
- antifreeze alarm A01 (remains active even at the end of the special operation if the unit was previously ON, deactivated by manual reset or in standby).
  A10=3: heaters ON based on the respective set point A04 and A08.

Do not use with H1= 6

- Antifreeze heater 2 set point in defrost/auxiliary in heating

A11: Heater 2 set point in heating, the control of the auxiliary heaters has been separated, each having its own activation set point (see A08).

- Dirty filter signal set point (air/air units only)

A12: Set point for the dirty filter signal based on B1-B2, the deactivation differential is A05
- Valid in the following conditions:
- air-air units;
- B1 is configured;
- outlet limit active;
- freecooling not active;
- at least 1 compressor ON.

The warning is reset automatically in the following conditions:
- air-air units;
- B1 is configured;
- outlet limit active;
- freecooling not active.

- Outlet limit set point in freecooling conditions

A13: With freecooling active, and only when the compressors are off, this represents the outlet limit. When the compressors are on, even if freecooling is active, the outlet limit alarm is bypassed and the antifreeze alarm is used.

- Antifreeze alarm set point from EVD

A14: With the EVD connected in the tLAN, A14 represents the evaporation temperature (sent by the EVD) below which the antifreeze alarm is activated; when the alarm is active, the compressors in the circuit affected are switched off, while the pump remains on to reduce the possibility of freezing. Manual reset (or automatic, depending on parameter P05), only occurs when the water temperature returns within the operating limits (that it, exceeds A14+A02

• Probe readings: parameters (B*)

- Select probe to be shown on display.

b00: Sets the probe reading to be displayed.

0= probe B1
1= probe B2
2= probe B3
3= probe B4
4= probe B5
5= probe B6
6= probe B7
7= probe B8
8= set point without compensation
9= dynamic set point with possible compensation
10= remote ON/OFF digital input status

For the list of parameter-probe associations see Table 4.d

Note: probes that are not present cannot be selected.

• Compressor settings: parameters (c*)

- Minimum ON time

c01: This establishes the time that the compressor must remain ON for when started, even if the stop signal is sent.

Key:
1. signal;
2. compressor;
3. min. ON time-interval.

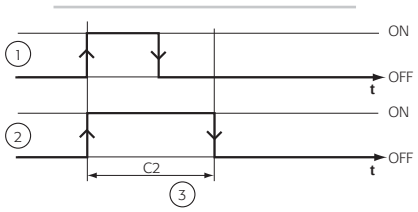


Fig. 5.a.c

- Minimum OFF time

c02: This establishes the time that the compressor must remain OFF for when stopped, even if the start signal is sent. The compressor LED flashes in this phase.

Key:
1. signal;
2. compressor;
3. min. OFF time-interval.

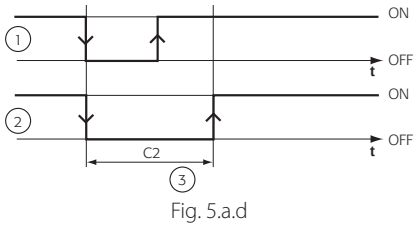


Fig. 5.a.d

- Delay between 2 starts of the compressor

c03: This sets the minimum time that must elapse between two successive starts of the same compressor (determines the maximum number of starts per hour for the compressor). The compressor LED flashes in this phase. If by mistake the user enters a value lower than the sum of C01 + C02, this parameter will be ignored and only the times C01 and C02 will be considered.

Key:
1. signal;
2. compressor;
3. min. time-interval between two ON routins.

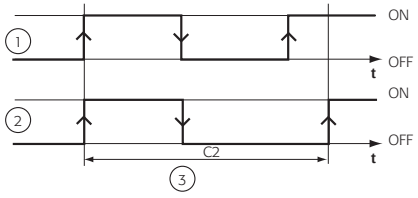


Fig. 5.a.e

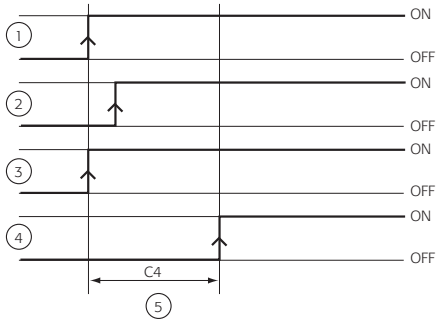


Fig. 5.a.f

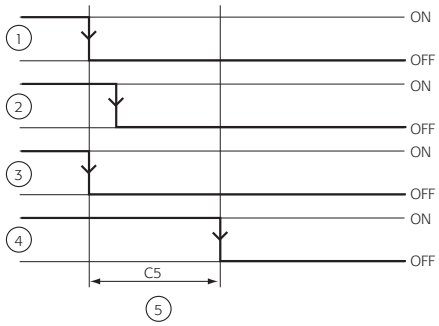


Fig. 5.a.g

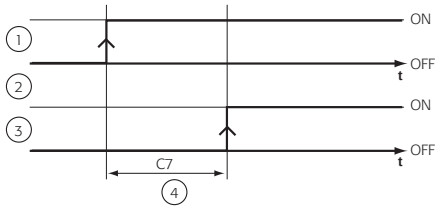


Fig. 5.a.h

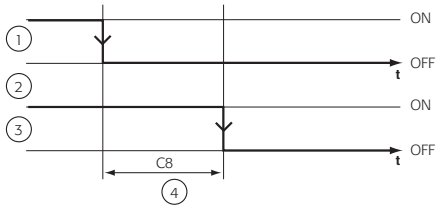


Fig. 5.a.i

- Start delay between compressors

c04: This sets the delay between the starts of the two compressors, so as to reduce the peak power input and make the compressors start more smoothly. The compressor LED flashes in this phase.

- In the event of capacity control, the delay c04 between compressor and valve becomes c04/2;
- In the event of defrost operation, the delay between compressor and compressor is 3 seconds, and between compressor and valve is 2 seconds.

Key:

1. 1st signal;
2. 2nd signal;
3. 1st compressore;
4. 2nd compressor;
5. time delay between two compressors ON routines/time-delay of the capacity-controlled routine.

- Stop delay between compressors

c05: This sets the stop delay between the compressors.

Key:

1. 2nd signal;
2. 1st signal;
3. 2nd compressor;
4. 1st compressore;
5. time delay between two compressors OFF routines/time-delay before the capacity-controlled routine.

- Delay on power-up (reset power supply)

c06: At power ON (when the controller is physically switched ON) the activation of all the outputs is delayed so as to distribute the power input and protect the compressor against repeated starts in the event of frequent power failures. This means that after the delay time, the controller will start to manage the outputs based on the other times and the other normal functions.

- Compressor start delay from pump/outlet fan (air/air) ON.

c07: In cooling and heating operation, if the operation of the pump (outlet fan) is subject to the controller (parameter H05=2), the compressor is started when required after the set time from the activation of the water pump (or outlet fan in air/air units).
If the pump/outlet fan is always ON (H05=1) and consequently does not depend on the control logic, the compressor is started after the set time from when the unit starts.

Key:

1. inlet fan;
2. pump;
3. compressor;
4. time-delay between pump-inlet fan and compressor.

- Pump/outlet fan (air/air) start delay from compressor OFF

c08: In cooling and heating operation, if the operation of the pump (outlet fan) is subject to the controller (parameter H05=2), when the compressor is requested to stop, the control first stops the compressor and the pump (outlet fan).
If the pump/outlet fan is always ON (H05=1), it is only stopped in standby mode.

Key:

1. compressor;
2. pump;
3. inlet fan;
4. time-delay between pump-inlet fan and compressor.

- Maximum tandem compressor operating time

c09: In the case of two compressors in tandem per circuit, one compressor should not operate for longer than the time set for c09 while the other compressor in the circuit is OFF. This prevents the oil shared in common from migrating over the allowed limit towards the active compressor, and consequently avoids damage when inactive compressor next starts (FIFO logic) due to poor lubrication. As a result, compressor 1 (or 2) in circuit 1, if requested to operate continuously, will actually stop OFF after the time c09 and hand over to compressor 2 (or 1) that was previously OFF. This function always considers the compressor times. Any value lower than the time set for c03 will be ignored, and the compressors (if the above condition is satisfied) will switch over after the time c03.
When C9=0, the function is disabled (the compressors will not switch over).

- Hour counter compressor 1-2-3-4

c10, c11, c12, c13: These indicate the number of operating hours of compressor 1, 2, 3, 4, expressed in hundreds of hours.
Pressing ▲ and ▼ together, when the hour counter is displayed, resets the hour counter and, consequently, cancels any maintenance requests in progress.

c10= operating hours comp. 1
c11= operating hours comp. 2
c12= operating hours comp. 3
c13= operating hours comp. 4

- Compressor operating hour counter threshold

c14: This sets the number of compressors operating hours, expressed in hundreds of hours, above which the maintenance request signal is sent.
c14= 0: function disabled.

- Evaporator pump/fan 1 hour counter

c15: This indicates the number of operating hours for the evaporator pump or fan 1, expressed in hundreds of hours.
Pressing ▲ and ▼ together, when the hour counter is displayed, resets the hour counter and, consequently, cancels any maintenance requests in progress.

- Condenser or backup pump/fan 2 hour counter

c16: This indicates the number of operating hours for the condenser pump (or backup) or fan 2, expressed in hundreds of hours.
Pressing ▲ and ▼ together, when the hour counter is displayed, resets the hour counter and, consequently, cancels any maintenance requests in progress.

- Minimum OFF time before the next pump/fan start

c17: The diagram below shows an example of the operation of the pump and with burst (active when H05=3, see parameter H05).
The dashed areas on the compressor line indicate the pump-compressor and compressor-pump delay times.
Burst mode is disabled in standby and during an alarm when the pump is OFF.
At power ON the delay c17 must elapse before burst can start.

- Minimum pump/fan ON time

c18: This represents the minimum time that the pump remains ON for, see Fig. 5.i (active with H05=3 see parameter H05).

- Delay between valve and compressor

c19: Represents the delay to ensure the valve opening before the compressor starts. This parameter is only available when EVD is connected.

• Defrost settings: parameters (d*)

The defrost has priority over the compressor times.
For the defrost function the compressors times are ignored, with the exception of C04 (see C04 description for the exceptions).

Key:
1. compressor;
2. pump;
3. burst.

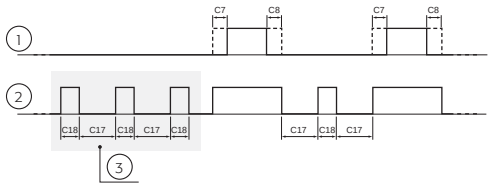


Fig. 5.a.j

- Enable condenser defrost/antifreeze

d01: For heat pumps with air-cooled condensers (H01=1, 3, 8), this establishes whether defrost control must be performed on the outdoor exchanger (evaporator in heating mode).
On the other hand, for water/water heat pumps with reversal on the gas circuit (H01=5-10), it enables antifreeze control on the cooling water for the outdoor exchanger, which becomes the evaporator in heating mode, see d03. If the fan is not present, the function is not enabled for air/water units.
d01=0: condenser defrost/antifreeze disabled;
d01=1: condenser defrost/antifreeze enabled.
In the defrost is running, the corresponding symbol will be shown on the display.

- Type of defrost

d02: establishes the type of defrost.
d02=0: the defrost has a fixed duration that depends on d07
d02=1: the defrost starts and ends according to the temperature or pressure thresholds, see d03 and d04;
d02=2: the pressure transducer and temperature probe are both located on the outside exchanger; the defrost starts when the value read by the pressure transducer is below the threshold d03 and ends when the value read by the temperature probe is above the threshold d04; during the defrost, the pressure probe controls the fan speed, as in chiller mode, so as to limit the pressure, even if the NTC probe, caked by ice, delays the end defrost. In any case, after the maximum time allowed for the defrost, the unit will always exit the defrost procedure.
d02=3: enable sliding defrost.
In the event of low outside temperatures, the evaporator pressure or temperature may fall below the threshold set to start the defrost (d03) even if there is effectively no ice on the coil. This can be corrected by shifting the start of the defrost proportionally to the lowering of the outside temperature. This procedure can be performed based on the temperature or the pressure alone, and not combined. It is disabled if the outside compensation probe is not fitted or is broken. It is performed based on the pressure only if both the pressure probe and temperature probe are configured.

- Start defrost temperature/pressure or condenser antifreeze alarm set point

d03: For heat pumps with air-cooled condensers (H01=1, 3, 8, 10, 12), this sets the temperature or pressure below which the defrost cycle starts. To start the defrost cycle, the condition must be valid for the time d05. For water/water heat pumps with reversal on the gas circuit (H01=5, 10), it defines the set point for the activation of the antifreeze alarm for the outdoor exchanger cooling water (evaporator in heating mode, on probe B3).
If sliding is defrost enabled, the start defrost temperature decreases (starting from d03) proportionally to the outside temperature.

- End defrost temperature/pressure

d04: Establishes the temperature or pressure above which the defrost cycle ends.

Defrost by temperature (d2= 1)

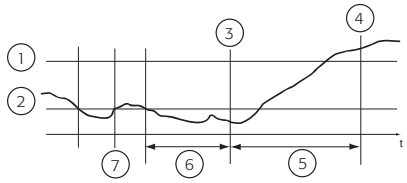


Fig. 5.a.k

- Minimum start defrost time

d05: Establishes the time that temperature/pressure must remain below the start defrost threshold d03, while the compressor is ON, for the defrost cycle to be activated.

Key:
1. end defrost T/P ;
2. start defrostT/P;
3. start defrostT;
4. end defrost;
5. min. time-interval to start a def. cycle (d6);
6. min defrost interval (d5);
7. timer reset.

- Minimum defrost duration

d06: Represents the minimum duration of the defrost cycle (the defrost continues even if the value read by the condenser probe exceeds the end temperature/pressure). If set to 0, the minimum defrost time function is disabled.
d06=0: control disabled.

- Maximum defrost duration

d07: If timed defrost is set (d02=0), this establishes the duration of the cycle.
If, on the other hand, the defrost ends at a set temperature/pressure, it represents the maximum duration (being in this case a safety feature, an alarm is signalled, "dF1" or "dF2").

- Delay between two defrost requests in the same circuit

d08: Represents the minimum delay between two successive defrost cycles.

- Defrost delay between the 2 circuits

d09: Represents the minimum delay between the defrost cycles on the 2 circuits.

- Defrost management from external contact

d10: This enables or disables defrost control from an external contact.
This function is typically used to end the defrost based on a signal from a thermostat/pressure switch connected to the corresponding digital input. In this case, the defrost times are ignored.
d10 = 0: function disabled.

Note: for the other settings, the start and end defrost are enabled for temperature and pressure values between the Defrost start and end set points

d10= 1: start defrost from external contact enabled therefore:
- if the contact of the input is open, the start of the defrost is enabled;
- if the contact of the input closed, the defrost follows the normal procedure.

d10= 2: end defrost from external contact enabled therefore:
- if the contact of the input is open, the end of the defrost is enabled;
- if the contact of the input is closed, the defrost follows the normal procedure.

d10= 3: start and end defrost from external contact enabled therefore:
- if the contact of the input is open, the end/start of the defrost is enabled;
- if the contact of the input is closed, the defrost follows the normal procedure.

- Antifreeze/auxiliary heaters in defrost

d11: This parameter determines whether, during the defrost cycle, the antifreeze/auxiliary heaters should be activated to limit the flow of cold water/air into the room.
d11 = 0: antifreeze/auxiliary heater not activated in defrost;
d11 = 1: antifreeze/auxiliary heater activated in defrost.

- Waiting time before defrost/delay in switching from heating to cooling

d12: As soon as the defrost condition arises, but before the actual cycle starts, the unit stops the compressor for the time d12 (selectable from 0 to 3 minutes). When the compressor stops, the four-way valve is switched (reversing of the cycle), after a time equal to d12/2; this waiting time allows the pressure to balance before starting the defrost cycle. In this procedure the compressor protection times are ignored, and consequently the compressor is stopped, and subsequently restarted, immediately.
If d12=0, the compressor is not stopped and the reversing valve is switched immediately.

- Waiting time after defrost/delay in switching from cooling to heating

d13: At the end of the defrost cycle, the unit stops the compressor for a time d13 (selectable from 0 to 3 minutes). When the compressor stops, the four-way valves is switched (reversing of the cycle), after a time equal to d13/2; this waiting time allows the pressure to balance and the outdoor coil to drip. In this procedure the compressor protection times are ignored, and consequently the compressor is stopped, and subsequently restarted, immediately.
If d13=0, the compressor is not stopped and the reversing valve is switched immediately.

- End defrost with two gas circuits/1 fan circuit

d14: This parameter is used to select, in units with two refrigerant circuits and one fan circuit, the end defrost mode.
d14 = 0 (default): the two circuits end the defrost independently (each according to their own temperature or pressure probe reading), only if H2= 1;
d14 = 1: when both the circuits have reached the defrost condition;
d14 = 2: when one of the two circuits has reached the end defrost condition.

- Start defrost with 2 circuits

d15: This parameter is used to select whether to defrost the two circuits together or separately.
d15 = 0 (default): the two circuits start defrosting independently (each according to their own temperature or pressure probe reading), only if H2=1;
d15 = 1: the two circuits start defrosting when both have reached the start defrost conditions;
d15 = 2: the two circuits start defrosting when at least one of the two has reached the defrost conditions.

	d14= 0	d14= 1	d14= 2
d15= 0	OK	OK	OK
d15= 1	OK	OK	OK
d15= 2	Not possible	OK	Not possible

Tab 5.b

- Forced ventilation time at end defrost

d16: If the parameter F13 = 2, as soon as the end defrost temperature or pressure is reached, the fans are activated at maximum speed for the set time, before the change in operating mode. Only at the end of this time will the cycle switch back to heat pump mode, with the normal management of the fans.

- Defrost with compressors OFF (Fan Defrost)

d17: This function allows the outside temperature to be exploited, when sufficient, to defrost the condenser (outdoor evaporator).
In these conditions, the unit, rather than reverse the cycle, simply turns OFF the compressors and activates the fans at maximum speed.
The start and end defrost conditions remain unchanged, as does the use of any auxiliary heaters.
The parameter has the following settings: d17=0: function disabled, d17>0: function enabled with relative set point (which represents the minimum defrost temperature set by the manufacturer). Above the set point, the unit performs the Fan Defrost.

- Max outside temperature threshold for sliding defrost

d18: This establishes the maximum value of the outside temperature below which sliding defrost is activated.

- Maximum temperature/pressure differential deviation for defrost

d19: This value is expressed in °C if the compensation is controlled by temperature, or in bar if controlled by pressure. The value set is subtracted from d03.

- Outside temperature differential for compensation saturation

d20: The value set is subtracted for d18.

• Fan settings: parameters (F*)

- Fan output

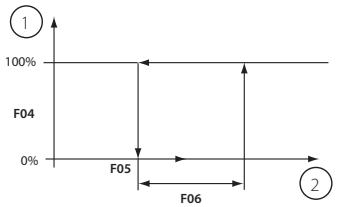
F01: Enables the operation of the fans.
F01=0: fans absent;
F01=1: fans present.
The PWM output (1 or 2, depending on the value of parameter H02) requires the presence of the optional fan control cards (ON/OFF for the CONVONOFF module or speed variation for MCHRTF or FCS three-phase).

- Fan operating mode

F02: This establishes the operating logic for the fans:
F02=0: always ON at maximum speed, independently from the compressors. The fans are only switched OFF when the unit is in standby.
F02=1: ON at maximum speed when at least one compressor in the corresponding circuit is ON (parallel operation in each circuit).
F02=2: ON when the corresponding compressor is ON, with ON/OFF control based on the temperature/pressure settings for the minimum and maximum speed (parameters F05-F06-F08 and F09). When the compressors are stopped, the corresponding fans are also stopped, irrespective of the condensing temperature/pressure.

Key:
1. speed %;
2. condensing temperature/pressure;
3. hysteresis.

Cooling ON/OFF



Heating ON/OFF

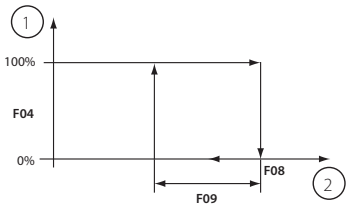
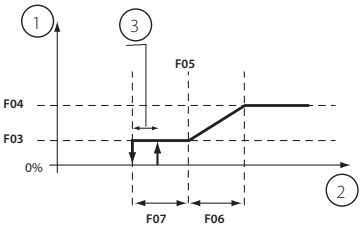


Fig. 5.a.l

Cooling with speed control



Heating with speed control

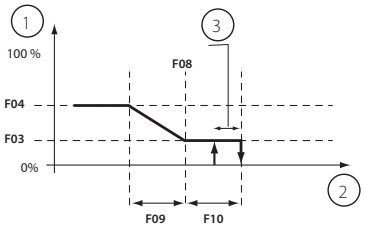


Fig. 5.a.m

F02=3: ON when the corresponding compressor is ON, with speed control. When the compressors are stopped the corresponding fans are also stopped, irrespective of the condensing temperature/pressure.

With F02=3 and an NTC condenser probe, when the compressor starts the fans are started at maximum speed for the time F11, irrespective of the temperature measured.
In the event of a condenser probe fault, the fans will be switched OFF.

- Minimum voltage threshold for Triac

F03: In the event of fan speed control, the optional phase cutting cards (MCHRTF*) are required, fitted with a triac. The voltage delivered by the triac to the electric fan motor corresponding to the minimum speed must be set. The set value does not correspond to the actual voltage in Volts applied, but rather to an internal unit of calculation in the μC²SE.
If using FCS controllers, set this parameter to 0.
F03 = Represents the minimum threshold for the triac

- Maximum voltage threshold for Triac

F04: In the event of fan speed control, the optional phase cutting cards (MCHRTF*) are required, fitted with a triac. The voltage delivered by the triac to the electric fan motor corresponding to the maximum speed must be set. The set value does not correspond to the actual voltage in Volts applied, but rather to an internal unit of calculation in the μC²SE. If using FCS controllers, set this parameter to 100.
F04 = Represents the maximum threshold for the triac

- Temperature/pressure set point for minimum speed in cooling

F05: This represents the temperature or pressure below which the fans remain ON at minimum speed. In the case of ON/OFF control, it represents the temperature or pressure below which the fans are switched OFF (Fig. 5.a.k).

- Temperature/pressure differential for maximum speed in cooling

F06: This represents the temperature or pressure differential in reference to F05 above which the fans are started at maximum speed; in the case of ON/OFF control, this represents the differential above which the fans are started (Fig. 5.a.k).

- Temperature/pressure differential for fans Off in cooling

F07: This represents the temperature or pressure differential in reference to F05 below which the fans are stopped. The fans are started 1 °C "lower" when using NTC temperature probes, or 0. 5 bars if using pressure probes. (Fig. 5.a.l)
If NTC temperature probes or pressure probes are used to control the condensing temperature/pressure, there is an activation hysteresis of 1 °C or 0.5 bar respectively.

- Temperature/pressure set point for minimum speed in heating

F08: This represents the temperature or pressure above which the fans are started at minimum speed (Fig 5.a.n).
For ON/OFF control, this represents the temperature or the pressure above which the fans are switched off (Fig 5.a.l).

- Temperature/pressure differential for maximum speed in heating)

F09: This represents the temperature or pressure above which the fans are started at minimum speed (Fig 5.a.l).
In the case of ON/OFF control, it represents the temperature or pressure above which the fans are switched OFF (Fig.5.a.k). For capacity control for low pressure this represents, subtracted from F08, the pressure limit below which the step disabled during capacity control is re-activated.

- Temperature/pressure differential for fans Off in heating

F10: If fan speed control is used, this represents the temperature or pressure differential in reference to F08 above which the fans are stopped. The fans are started 1 °C "lower" if using NTC temperature probes or 0. 5 bars lower if using pressure probes.
When using NTC temperature or pressure probes for condenser control, the fans are started with an hysteresis of 1 °C or 0. 5 bar.

- Fan start time

F11: This establishes the operating time at maximum speed when the fans are started, so as to overcome the mechanical inertia of the motor.
The same times are observed in reference to the start of the compressor (irrespective of the condensing temperature/pressure), if NTC temperature probes are used on the condenser and speed control is enabled, F02=3; this is done to bring forward the sudden increase in pressure (which does not necessarily correspond to a likewise rapid increase in temperature in the area where the probe is located) and consequently to improve control

F11=0: the function is disabled, that is, the fans are activated at the minimum speed and then controlled based on the condensing temperature/pressure.

- Triac impulse duration

F12: This represents the duration in milliseconds for the impulse applied to the triac. For induction motors, set the parameter to 2 (default). On the other hand, when using the CONVONOFF0, CONV0/10A0 modules or FCS controllers, set the parameter to 0.

- Fan management mode in defrost

F13: This parameter sets the operating logic for the condensing fans during the defrost phase:
F13 = 0: (default) the fans are OFF.
F13 = 1: the fans are ON as in cooling mode, based on the temperature or pressure.
F13 = 2: the fans are OFF until the end defrost temperature or pressure is reached, above which they are started at maximum speed for the time set for parameter d16. Only at the end of this time will the cycle return to heat pump mode with the normal management of the fans.

Note: If the unit is running the Fan Defrost function (parameter d17), the fan management selected by F13 is disabled.

- Fan on time when starting in high condensing temp.

F14: establishes the time the fans are operated at maximum speed if starting with a high condensing temperature.
F14 = 0: function disabled.
F14 > 0: fan on time (in seconds).
The function is operational only in chiller mode, if the probe on the condenser is a temperature sensor and only for air-cooled units. When the first compressor in the circuit in question starts, it is assumed that the temperature of the environment is close to the temperature of the condenser; if the value read by the condenser probe is higher than the value of F05-F07, as well as starting the compressor, the fans in the circuit in question are forced on at maximum speed for the time set by F14.

- Activate low noise

F15: This function moves the condensing pressure set point so as to lower the fan speed and consequently reduce noise (specifically at night). If low noise is active in cooling, the condenser control set points are increased by F16. If low noise is active in heating, the set points are reduced by F17.
F15= 0: Low noise deactivated.
F15= 1: Low noise activated in cooling.
F15= 2: Low noise activated in heating.
F15= 3: Low noise activated in cooling and heating.

N.B. The variation in the set point is not active during defrost

- Cooling set point differential

F16: Differential added to the condenser control set point when low noise is active (valid for both temperature and pressure control).

- Heating set point differential

F17: Differential subtracted from the condenser control set point when low noise is active (valid for both temperature and pressure control).

• Unit settings: parameters: (H*)

- Unit model

H01: Used to select the type of unit being controlled:
H01= 0: 0: air/air units
H01= 1: AIR/AIR heat pump
H01= 2: AIR/WATER Chiller
H01= 3: AIR/WATER heat pump
H01= 4:WATER/WATER Chiller
H01= 5: water/water heat pump with rev. on gas (*)
H01= 6: water/water heat pump with rev. on water (*)
H01= 7: air-cooled condensing unit
H01= 8: air-cooled condensing unit with reversal on gas circuit
H01= 9: water-cooled condensing unit
H01= 10: water-cooled unit condensing with reversal on gas circuit
H01= 11: cooling-only air-air unit with electric heating

(*) **Note:** Set H21= 4 (Condenser pump always on), if H02= 1 (Two condensers).

- Number of condenser fan circuits/water condensers

H02: This establishes the number of fan circuits present in the configurations with two circuits. With one fan circuit (H02=0) the unit may have 1 or 2 refrigerant circuits:

- with one refrigerant circuit, the fans are exclusively controlled based on the pressure or temperature read by the sensor in the first circuit;
- with two refrigerant circuits, the fans are controlled based on the higher temperature/pressure of the two circuits. In heat pump mode, the output depends on the lower temperature or pressure.
  The output used is Y1. Vice-versa, with 2 ventilation circuits (H02=1) each PWM output is independent and depends on its own condenser probe (B3 or B4 for circuit 1 and B7 or B8 for circuit 2).

- Number of evaporators

H03: This establishes the number of evaporators present when there are 2 or 4 compressors, obviously with 2 circuits (including the expansion). With one evaporator (H03=0), the management of the heaters and the antifreeze function is performed only on B2. Vice-versa, with 2 evaporators (H03=1) antifreeze control will be performed using B2 and B6, while input B5 is used to control the water outlet temperature.

- Number of compressors/circuits

H04: This establishes the number of compressors per circuit and the number of circuits. For further details see Table 4.g.

- Evaporator pump/fan operating mode

H05: This establishes the operating mode for the evaporator water pump or the outlet fan (in air/air units).
H05 = 0: pump disabled, (the flow switch alarm is ignored)
H05 = 1: always ON (the alarm is managed)
H05 = 2: ON when called by compressor (the alarm is managed)
H05 = 3: the pump will be started and stopped at regular intervals (independently from the compressors) as per the Burst setting (see parameters c17 and c18).
H05= 4: follow hot keep or hot start in heating, always on in cooling
H05= 5: follow hot keep or hot start in heating, follow the compressors in cooling.
When the heating or cooling signal is received, first the evaporator pump/outlet fan starts (always ON), and then the compressor, after the set times (c07, c08). The pump will not be stopped until all the compressors are Off.

- Cooling/heating digital input

H06: Establishes whether the cooling/heating selection from digital input is enabled. see parameters P08, P09, P10, P11, P12 and P13). The open status places the unit in cooling operation, vice-versa, in heating.
D-IN Open = Cooling
D-IN Closed = Heating

- ON/OFF digital input

H07: Establishes whether the ON/OFF selection from digital input is enabled or disabled. If the selection is enabled (H07= 1), the "open" status switches the unit Off, while in the "closed" status, the unit may be OFF or ON, as controlled by the keypad.
This parameter is not valid for condensing units.

- µC²SE network configuration

H08: Establishes the layout of the tLan network.
0= µC²SE only
1= µC²SE + valve
2= µC²SE + exp.
3 = µC2SE + exp.+ 2 valves
4 = µC2SE + exp.+ 1valve

- Enable keypad

H09: Used to disable the modification of the DIRECT and USER parameters from the keypad. The value of the parameters can always be displayed. The enable/disable cooling, heating and reset counter functions are also available.
Values:
0: keypad disabled
1: keypad enabled (default)

- Serial address

H10: Establishes the address of the instrument for the serial connection, via an optional board, to a PC for supervision and/or telemaintenance.

- Selection map outputs

H11: This parameter is used to arbitrarily associate some digital outputs to the devices on the unit.
H11= 0: standard (default); for units with one compressor per circuit (H04=0, 2).
H11= 1: For cooling only units with two compressors (H01=0, 2, 4, 7, 9 and H04=1, 3, 5)
H11= 2: The outputs of the expansion follow the same logic for the 2nd circuit. For H01= 1, 3, 5, 6, 8, 10 and H04= 1, 3, 5
H11= 3: The outputs of the expansion follow the same logic for the 2nd circuit. For H01= 1, 3, 5, 6, 8, 10 and H04= 1, 3, 5
H11= 4: For H01= 1, 3, 5, 6, 8, 10 and H04= 0, 1
H11= 5: For cooling only units with two compressors (H01= 0, 2, 4, 7, 9, and H04= 0)
H11= 6: 1 compressor per circuit, heat pump
H11= 7: 1 compressor per circuit, cooling only, solution 1
H11= 8: 1 compressor per circuit, cooling only, solution 2
H11= 9: 2 compressors per circuit, heat pump
H11= 10: 2 compressors per circuit, cooling only, solution 1
H11= 11: 2 compressors per circuit, cooling only, solution 2

H11= 12:

	associated device					
outputs	H11=0	H11= 1	H11= 2	H11= 3	H11= 4	H11= 5
C1	compressor 1	compressor 1	compressor 1	compressor 1	compressor 1	compressor 1
C2	heater 1	heater 1	heater 1	reversing valve 1	reversing valve 1	heater 1
C3	Pump/evaporator (fan) (on air/air units)	Pump/evaporator (fan) (on air/air units)	Pump/evaporator (fan) (on air/air units)	Pump/evaporator (fan) (on air/air units)	evaporator pump	Pump/evaporator (fan) (on air/air units)
C4	reversing valve 1	Compressor 2 (or capacity control comp. 1)	Compressor 2 (or capacity control comp. 1)	Compressor 2 (or capacity control comp. 1)	Compressor 2 (or capacity control comp. 1)	condenser fan 1
C5	alarm	alarm	reversing valve 1	alarm	alarm	alarm
C6	compressor 2	compressor 3	compressor 3	compressor 3	not used	compressor 2
C7	heater 2	heater 2	heater 2	reversing valve 2	heater 1	heater 2
C8	Condenser pump/backup	Condenser pump/backup	Condenser pump/backup	Condenser pump/backup	Condenser pump/backup	Condenser pump/backup
C9	reversing valve 2	Compressor 4 (or capacity control comp. 2)	Compressor 4 (or capacity control comp. 2)	Compressor 4 (or capacity control comp. 2)	not used	condenser fan 2
C10	Warning	Warning	reversing valve 2	Warning	Warning	Warning

	associated device						
outputs	H11= 6	H11= 7	H11= 8	H11= 9	H11= 10	H11= 11	H11= 12
C1	compressor 1	compressor 1	compressor 1	compressor 1	compressor 1	compressor 1	compressor 1
C2	1 step heater	1 step heater	1 step heater	compressor 2	compressor 2	compressor 2	P25
C3	outlet fan	outlet fan	outlet fan	outlet fan	outlet fan	outlet fan	P26
C4	reversing valve 1	2 step heater	condenser fan 1	reversing valve 1	heating step 1	heating step 1	P27
C5	alarm	alarm	alarm	alarm	alarm	alarm	P28
C6	compressor 3	compressor 3	compressor 3	compressor 3	compressor 3	compressor 3	compressore 3
C7	2 step heater	P29	2 step heater	compressor 4			P29
C8	open freecooling/ freeheating	open freecooling	open freecooling	open freecooling/ freeheating	open freecooling/ freeheating	open freecooling/ freeheating	P30
C9	reversing valve 2	humidifier (ON/OFF)	condenser fan 2	1 step heater	heating step 2	humidifier	P31
C10	close freecooling/ freeheating	close freecooling	close freecooling	close freecooling/ freeheating	close freecooling/ freeheating	close freecooling/ freeheating	P32

Parameters P25 to P32 can have the following meanings:
0 = no function associated with the relay
1 = compressor 2
2 = Heater 1
3 = Reversing valve 1
4 = Pump/inside fan
5 = Open freecooling/freeheating
6 = Close freecooling/freeheating
7 = Humidifi er
8 = Condenser fan 1 on/off
9 = Heater 2
10 = Alarm
11 = Boiler contact
12 = compressor 4
13 = Reversing valve 2
14 = Pump/inside fan 2nd evaporator
15 = Condenser fan 2 on/off
16 = Warning
17 = Condenser pump/Backup

- Capacity-control logic

H12: Specifies the logic for the activation of the capacity-control steps for the compressors and the 4-way reversing valve.
H12 = 0: 4-way reversing valve and capacity-control normally energised
H12 = 1: 4-way reversing valve and capacity-control normally de-energised. Default value.
H12 = 2: 4-way reversing valve normally de-energised and capacity-control normally energised
H12 = 3: 4-way reversing valve normally energised and capacity-control normally de-energised.

Note: in the event of capacity-control, the rotation between compressor and corresponding valve is disabled. FIFO or time logic can be used between the 2 circuits to optimise the starts or the operating hours of the 2 compressors (1 per circuit).

- Enable pump down

H13: This function allows the unit to be stopped while avoiding the possible formation of liquid refrigerant inside the evaporator. When the only active compressor is called to stop, the expansion valve is closed so as to depressurise the circuit.
Valid only when the driver is installed, as the driver pressure probe is used.

- Minimum pumpdown pressure

H14: Limit pressure below which the compressor is deactivated.

- Maximum pumpdown time

H15: Maximum time after which the compressor is deactivated.

- SmartSET "CAREL patent" (cannot be used on air/air units)

H16: Activate smartSET, this function optimises the operation of the unit by calculating the efficiency of the heat exchangers.

In smartSET mode, the following values are saved:
- Only when R06= 0 or 4;
- DTE: difference between evaporator inlet temperature (B1) and outlet temperature (B2/B5), calculated at full load (all compressors on) when reaching the user set point. Saved to memory on the E2P;
- DTC 1: difference between outside exchanger temperature (B3) and outside temperature (B4,....) (this implies the configuration of a dedicated probe, optional setting). It is calculated whenever condenser fan 1 runs at maximum speed for 30s, irrespective of the status of the compressors;
- DTC 2: (calculated only when there are 2 condensers) difference between outside exchanger temperature (B7) and outside temperature (B4,....) (this implies the configuration of a dedicated probe, optional setting). It is calculated whenever condenser fan 2 runs at maximum speed for 30s irrespective of the status of the compressors.

With proportional inlet control, the dynamic set point (STD) and the corresponding proportional band are adapted according to the DTE.

With outlet control and dynamic logic, that is, dead zone and activation/deactivation times, the dead zone has a dynamic value.
In this case too, control will be optimised according to the actual DTE measured.

- Minimum DTE value allowed

H17: Even if there is not danger involved, beyond the limit a warning is sent ("dEL") to check the water flow-rate, which is perhaps too high, or low condenser efficiency.

- Maximum DTE value allowed

H18: Maximum value allowed for DTE, above the limit the evaporator risks freezing, the anomalous behaviour is signalled by "dEH".

- Maximum DTC value allowed

H19: Maximum value allowed for DTC, above this value the condenser may be dirty (chiller) or dirty/frozen (heat pump).

- Function of the second pump

H21: This parameter defines how the output dedicated to the second pump must be managed.
H21= 0: the second pump is disabled.
H21= 1: the second pump is used only as a backup.
If the flow switch and corresponding alarm are activated, the pumps are switched over:

- if the alarm passes, a warning is shown on the display and the warning relay is activated, while the unit continues to operate with the Backup pump. When the next alarm is activated the pumps will be switched over.
- if the alarm remains active even with the second pump on for longer than the time set for P1, the generic alarm is generated and the unit is switched OFF.

H21= 2: the second pump represents a backup pump. The two pumps are never used at the same time but each 24 hours, are switched over. In the event of flow alarms, the logic is the same as for setting 1. After being switched over due to the flow alarm, the 24-hour timer is set to zero.
H21= 3: the second pump is used as an ON/OFF device in the same way as the condenser fan (which in this case is not present), in ON/OFF mode, with the same settings (in fact in this case the pump replaces the fan, including the symbol).
H21= 4: the second pump is used for the condenser but is always ON. In this case the pump symbol is
not managed.

Note: In the event of flow alarms with automatic reset, 10 attempts are made to restart the pump every 90 seconds, for a maximum time of P02; after the 10 attempts, the alarm becomes manual reset. With the second pump, the attempt consists in switching over the pump that is on, with the same logic.

- Disable load default values

H22: If this parameter is set to 1, it disables the possibility of restoring the default parameters using the PRG button at power ON.

- select supervisor protocol

H23: establishes the protocol used for the connection to the supervisor from the serial board RS485
H23 = 0: CAREL protocol (baud rate 19200,…)
H23 = 1: Modbus protocol

• Alarm settings: parameters (P*)

- Flow switch alarm delay when starting pump

P01: Establishes a delay in the recognition of the flow switch alarm when starting the pump (this allows the flow-rate to stabilise). In the event of alarms, the compressors are stopped immediately, ignoring the times.

- Flow switch alarm delay in steady operation

P02: Establishes a delay in the recognition of the flow switch alarm in steady operation, so as to filter any variations in flow-rate or air bubbles present in the water circuit. In the event of alarms, the compressors are stopped immediately, ignoring the times.

- Low pressure alarm delay at compressor start

P03: Establishes a delay in the recognition of the low pressure alarm when the compressor starts, so as to allow stable operating conditions to be reached. This delay is also counted when reversing the 4-way valve in the refrigerant circuit.

- Part load in high pressure and low pressure in heat pump

P04: enable or disable the part load operation of the circuit in high pressure.
The function is valid if the unit is fitted with tandem or capacity controlled compressors and pressure transducers. In the event of high pressure alarms, that is, for values over P18 (hysteresis 0.5 bar), the controller deactivates a load step in the circuit in question and waits 10 seconds. After this interval, if the alarm is still active, the unit is stopped, otherwise it continues to operate in part load mode. In this situation, the display shows the message PH1 and/or PH2, depending on the circuit. This condition remains active until the pressure falls below the value corresponding to the maximum speed of the condenser fans (F05+F06). Below this value, the unit reactivates the load step that had previously been deactivated.

P04=0: capacity control not activated
P04=1: capacity control activated for high pressure
P04=2: capacity control activated for low pressure
P04=3: capacity control activated for high and low pressure

With the unit operating in heat pump mode, due to low outside temperatures or the load the pressure may fall and stop the unit due to the low pressure alarm. If the circuit has 2 compressor steps and the pressure remains below the value of one bar for the time P22, the circuit can operate at part load. This capacity control is not activated when the alarm comes from the digital input. In the event of low pressure, the controller deactivates one step and if the pressure does not return above the threshold in 10 seconds, the alarm is activated and the circuit is stopped. This function is valid for all units with pressure transducers.

Part load in low pressure

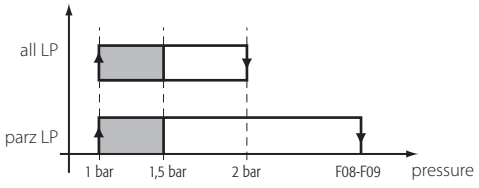


Fig. 5.b.b

- Alarm reset

P05: Enables automatic reset for all those alarms that normally feature manual reset (high pressure, low pressure, flow switch/antifreeze) as per the following table:
P05= 0: (default) high pressure, low pressure and antifreeze (low temperature) with manual reset;
P05= 1: all the alarms with automatic reset;
P05= 2: high pressure and antifreeze (low temperature) manual, low pressure automatic;
P05= 3: high pressure manual, low pressure and antifreeze (low temperature) automatic;
P05= 4: high and low pressure manual, antifreeze (low temperature) automatic;
P05= 5: high and low pressure manual after the third activation in one hour*, antifreeze (low temperature) automatic;
P05= 6: high and low pressure manual after the third activation in one hour*, antifreeze (low temperature) manual.

*: the high and low pressure alarms are managed in the same way both for the transducers and the pressure switches (digital input); if the unit is in standby the count (3 times in one hour) is reset.

- Cooling/Heating logic

P06: If this parameter is set to 1, the operating logic of the Cooling/Heating logic is reversed (from the keypad, the remote control and the digital input).

Symbol	P06= 0	P06= 1
☼	Cooling (Chiller)	Heating (heat pump)
❄	Heating (heat pump)	Cooling (Chiller)

- Low pressure alarm with pressure probes

P07: P07=0: this function is disabled.
P07=1: if in heat pump mode the evaporator (external exchanger) pressure is less than 1 bar (and if the presence of the condenser pressure probe is enabled), the low pressure alarm is activated (while still considering the delay P03).

Note: P07=1 the LP digital inputs in heat pump are ignored.

- Select digital input ID1

P08= 0: none;
P08= 1: flow switch with manual reset (normally closed);
P08= 2: flow switch with automatic reset (N.C.);
P08= 3: general thermal overload with manual reset (N.C.);
P08= 4: general thermal overload with automatic reset (N.C.);
P08= 5: thermal overload circuit 1 with manual reset (N.C.);
P08= 6: thermal overload circuit 1 with automatic reset (N.C.);
P08= 7: thermal overload circuit 2 with manual reset (N.C.);
P08= 8: thermal overload circuit 2 with automatic reset (N.C.);
P08= 9: cooling/heating (open = Cooling, closed = Heating) if H06= 1;
P08= 10: cooling/heating with delays d12 and d13 (open = Cooling, closed = Heating) if H06= 1;
P08= 11: alarm signal with manual reset (N.C.);
P08= 12: alarm signal with automatic reset (N.C.);
P08= 13: second set point from external contact (cooling and heating), (normally open);
P08= 14: second cooling set point from external contact and heating from time band (N.O.);
P08= 15: end defrost from external contact circuit 1 (N.C.);
P08= 16: end defrost from external contact circuit 2 (N.C.);
P08= 17: end defrost from external contact circuit 1 (N.C.);
P08= 18: end defrost from external contact circuit 2 (N.C.);
P08= 19: condenser step 1 (N.O.);
P08= 20: condenser step 2 (N.O.);
P08= 21: condenser step 3 (N.O.);
P08= 22: condenser step 4 (N.O.);
P08= 23: remote ON/OFF;
P08= 24: compressor 1 failure;
P08= 25: compressor 2 failure;
P08= 26: compressor 3 failure;
P08= 27: compressor 4 failure.

note 1: if P08 is set to 10, the change in state considers the times d12 and d13, and respects the compressor protection times, both from the digital input and the keypad.
note 2: if the digital input is used to switch the unit ON/OFF or change the operating mode, these functions are disabled on the keypad.
note 3: ID5 for the condensing unit with reverse cycle has the function of cooling/heating changeover

- Select digital inputs ID2, ID6, ID7, ID10, ID5

P09, P10, P11, P12, P34: Configuration of digital inputs ID2, ID6, ID7, ID10, and ID5 respectively (as per the table above for digital input ID1).

Note: Cooling/heating (9, 10) cannot be set on P10, P11, P12, and P14.

- Select input B4 if /04 = 1

P13: If input B4 is used as ON/OFF (/04 = 1) the same options are valid as for P08.

- Select input B8 if /08 = 1

P14: If input B8 is used as ON/OFF (/08 = 1) the same options are valid as for P08.

- Select low pressure alarm

P15: Used to select whether the low pressure alarm is detected when the compressor is OFF (P15=1) or alternatively only when the compressor is ON (P15=0, default).
When the compressor starts the alarm is in any case ignored for the time P03.

- High temperature/high system start-up temperature alarm delay

P16: Represents the high temperature alarm threshold detected by probe B1; the differential is set at 2 °C and the alarm is reset automatically (the warning relay is activated, signal only, and the message "Ht" is shown). When starting the system, this alarm is ignored for the time P17. If the system start-up protection is enabled (see parameter P20) and the alarm is activated, the time P17 is ignored and the alarm has no hysteresis.

- High temperature alarm delay on power-up
P17: High temperature alarm delay when the control is switched on (power ON), from the remote ON/OFF contact or from the keypad.

- High pressure alarm from transducer set point
P18: Sets the value beyond which the high pressure alarm is generated. Each circuit will be managed by its own transducer.
P18= 0: the function is disabled.
For all other values greater than 3.0, due to the hysteresis (3 bars), the alarm is managed according to the set value.

- Low system start-up temperature alarm set point
P19: Represents a threshold for the low temperature (measured by probe B1) alarm, without hysteresis; it is reset automatically (the alarm relay is not activated and the display shows the message "ALt").

- System start-up protection for high/low temperature
P20: If set to 1, this parameter enables the system protection function when starting, both at power ON and when switching ON from Standby.
In chiller mode (cooling), for values of B1 greater than the set point P19, an alarm is activated and the unit is not started (display "AHt").
In heat pump mode (heating), for values lower than the set point P19, an alarm is activated and the unit is not started (display "ALt").
The alarm is reset automatically.
P20=0: the function is not enabled.

- Low pressure alarm waiting time in heat pump
P22: Delay in generating the low pressure alarm in heat pump mode
If the pressure remains below 1 bar for the time p22 and the circuit has 2 compressor steps, the circuit can operate at part load (see P04). This preventive capacity control function remains active until the pressure rises above F08-F09.

- Low pressure alarm waiting time during defrost
P23: Delay in generating the low pressure alarm in heat pump mode during defrost

- Deactivate compressors in capacity control for HP and LP
P24: Decide which compressor must be stopped in each circuit during capacity control
P24= 0 stops compressors 1 and 3
P24= 1 stops compressors 2 and 4

- Low pressure alarm set point from transducer
P33: : Sets the value beyond which the low pressure alarm is generated when the unit is operating in heat pump mode. Each circuit will be managed according to its own transducer.
P33= 0 the function is disabled.

- Mute alarm relay using "PRg/mute" button
P35=0 the PRG/mute button does not alter the status of the relay, if the alarm is active and in progress.
P35=1 the PRG/mute button alters the status of the relay even if the alarm is active and in progress, as if it were a buzzer or a siren.

- High pressure alarm management
P36: the parameter is used to consider the high pressure alarm even when the compressor is off or consider it only when the compressor is on, depending on whether the pressure switch is directly connected to the digital input on the controller or via another circuit.
P36=0: high pressure alarm always considered (pressure switch connected directly to the digital input).
P36=1: high pressure alarm considered 2 seconds after starting the compressor.

• Control settings: parameters (r*)
- Cooling set point
r01: between r13 and r14
r02: cooling differential value of DTE when the unit is first started (autotuning enabled)

- Heating set point (heat pump)
r03: between r15 and r16
r04: heating differential value of DTE when the unit is first started (autotuning enabled)

- Compressor rotation
r05: The rotation of the compressors allows the operating hours to be balanced either statistically, using FIFO logic, or absolutely, by counting the effective operating hours. Settings:
r05=0: rotation disabled; The customer can use compressors with different power ratings according to the desired logic or manage the capacity-control functions. The compressors are started/stopped in proportional mode.
r05=1: rotation with FIFO logic (first ON, first OFF, and vice-versa first OFF, first ON); in this mode the operating hours are optimised together with the number of starts, even if the compressor safety times are always respected.
r05=2: rotation with control of operating hours; in this way the compressors will have the same operating hours, as the compressor with the least operating hours is always started first, again observing the safety times. This does not however consider FIFO logic and does not optimise the starts and stops. In the case of capacity controlled compressors (1 per circuit), FIFO logic or timed operation will refer to the actual circuit and not the compressor valves. If, for example, when capacity is required from circuit 1, compressor 1 starts first, capacity controlled (not at full capacity), and then the valve is managed as a second step, so that the compressor will work at maximum efficiency. If

less capacity is required, the second step will be deactivated first, and then the compressor. There is no rotation between the compressor and the valve. If extra capacity is required, the second circuit will start with compressor 2 and then, if required, the valve is operated.
When stopping, the valve is managed first and then the actual compressor as a whole. Both FIFO logic and timed operation will involve either one circuit or the other. The activation and deactivation of the valves are not subject to timers, but rather only a hysteresis that is equal to the set point and the differential of the step (in fact the valve performs the same function as a hermetic compressor).
r05=3: direct correspondence between the digital inputs and the compressor relays (condensing units only).

- Type of compressor control

r06: This parameter is used to set the logic for maintaining the set point:
r06= 0: proportional on inlet
r06= 1: proportional on inlet + dead zone (see Dead zone, below)
r06= 2: proportional on outlet
r06= 3: proportional on outlet with dead zone
r06= 4: on outlet by time with dead zone (see timed outlet temperature control)

DEAD ZONE

The dead zone essentially shifts the proportional band from the set point by the value set for the parameter r07.This parameter is valid in all configurations if enabled (for r07≠0: dead zone set and enabled).

Key Figure 5.b.c:
r06: enable the dead zone (enabled if r06=1 or 3)
r07: dead zone
r01: cooling set point
r02: cooling differential

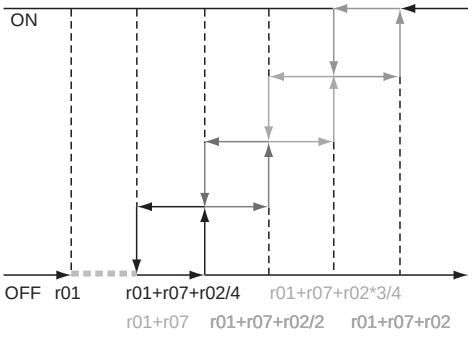


Fig. 5.b.c

In chiller (cooling) mode, the dead zone moves the cooling proportional band above the set point by the value r07.

Key Figure 5.b.d:
r06: enable the dead zone (enabled if r06=1 or 3)
r07: dead zone
r03: heating set point
r04: heating differential

In heat pump (heating) mode, the dead zone moves the heating proportional band below the set point by the value r07.

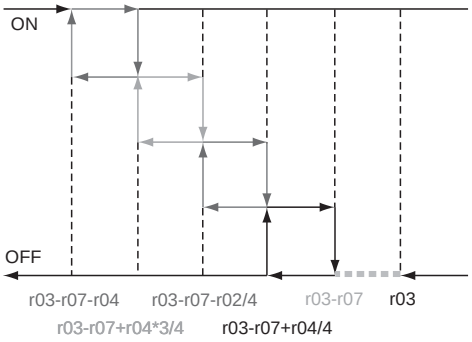


Fig. 5.b.d

Outlet temperature control by time r06 = 4 (only chiller)
This type of control is based on the need to maintain the outlet temperature as constant as possible, despite the load being variable or the reduced inertia of the system.
The logic has the aim of keeping the temperature inside the dead zone.
If outside the zone, the compressors will be activated with the logic described below, so as to return inside the dead zone, neither too quickly (using an integral or derivative), nor too slowly, with fixed time
logic. There are two logical times involved: the activation time and deactivation time.

- Dead zone differential

r07: (see dead zone)

- Activation delay at lower limit of r07 (if r06 = 4)

r08: The value set is used in the control algorithm (see timed outlet temperature control) as the maximum time (at the start of the differential) for the activation of the compressors.

- Activation delay at upper limit of r07 (if r06 = 4)

r09: The value set is used in the control algorithm (see timed outlet temperature control) as the minimum time (at the end of the differential) for the activation of the compressors.

Activation time (cooling)
The activation time is not a set parameter, but rather the combination of two set parameters, that is, r08 and r09. When the temperature leaves the dead zone, the activation time is equal to r08, while at the end of the differential r02 the activation time is equal to r09.
Inside the differential r02, the activation time varies linearly between r08 and r09.
This means that as the temperature moves away from the set point, the times are reduced and the esponse of the process becomes more dynamic.

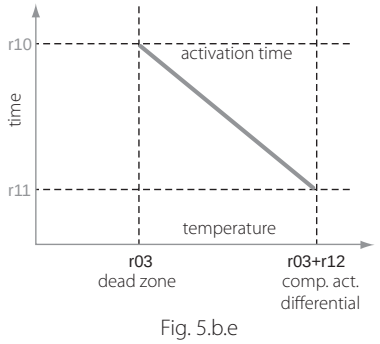


Fig. 5.b.e

- Deactivation delay at upper limit of r12 (if r06 = 4)

r10: The value set is used in the control algorithm (see timed outlet temperature control) as the maximum time (at the set point) for the deactivation of the compressors.

- Deactivation delay at lower limit of r12 (if r06 = 4)

r11: The value set for this parameter is used in the control algorithm (see timed outlet temperature control) as the minimum time (at the end of the deactivation differential) for the deactivation of the compressors.

In heating:
With autotuning active and inlet control, this represents the delay from switching the compressor off to reach the outlet set point, before the next deactivation.

- Compressor deactivation differential (if r06 = 4)
r12: This represents the temperature differential for the deactivation of the compressors, according to the procedure described in "Deactivation time".

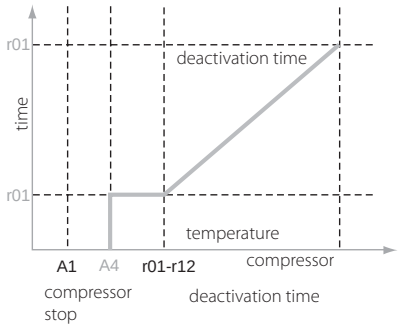


Fig. 5.b.f

Deactivation time (cooling) Fig. 5.b.f
In the same way as for the activation time, the deactivation time also varies between a maximum value, set for the parameter r10 and corresponding to the set point temperature, and a minimum, set for the parameter r11 corresponding to the end of the differential for the deactivation of the compressors, set by the parameter r12.

Below this value, the deactivation time will be equal to the minimum set until reaching the temperature A04, after which all the compressors will be switched OFF, irrespective of the times. As the temperature moves away from the set point, the response of the process becomes more dynamic.

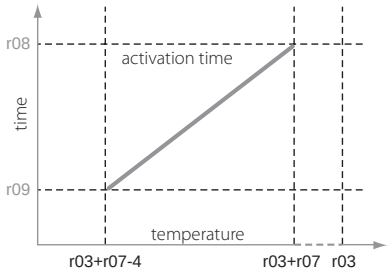


Fig. 5.b.g

Activation time (heating) Fig. 5.b.g
In heating mode, the activation time will increase as the deviation from the set point increases. The set point is the heating set point r03 with the corresponding differential r04. The parameters for setting the activation times are always r08 and r09.

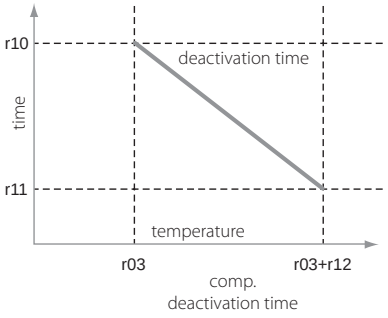


Fig. 5.b.h

Deactivation time (heating)
In heating mode, if the temperature rises above the set point, the deactivation time will decrease more the further the temperature moves away from the heating set point r03. At the end of the differential r12, the time will be the minimum set by parameter r11.

- Minimum Cooling set point
r13: Establishes the minimum limit for setting the Cooling set point.

- Maximum Cooling set point
r14: Establishes the maximum limit for setting the Cooling set point.

- Minimum heating set point
r15: Establishes the minimum limit for setting the heating set point.

- Maximum heating set point
r16: Establishes the maximum limit for setting the heating set point.

- Cooling compensation constant (chiller mode):
r17: Sets the coefficient that controls the cooling compensation algorithm. In cooling mode, if r17 is positive, the set point increases as the outside temperature increases (measured by the outside probe); if on the other hand r17 is negative the set point decreases as the outside temperature increases.
This difference in the set point from the set value can have a maximum absolute value equal to the setting of r18. The values for the parameters shown on the graph are: r17=±2, r01=25, r19=32 and r18=5).

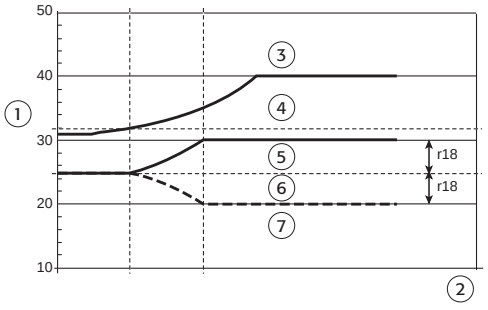


Fig. 5.b.i

Key:
1. temperature;
2. time;
3. external temperature (probe B3/B4);
4. comp. start temperature (r19);
5. positive compensation (r17= 2);
6. set point (r1);
7. negative compensation (r17=-2).

- Maximum deviation from the set point

r18: Indicates the maximum deviation from the set point beyond which compensation is stopped (maximum and minimum limits in reference to the set point).

- Start compensation temperature in cooling (outside probe)

r19: Sets the temperature (measured by the outside probe) above which the compensation function starts (cooling), value between -40T80 °C.

- Start compensation temperature in heating (outside probe)

r20: Sets the temperature (measured by the outside probe) below which the compensation function starts (heating), the value must be between -40T80 °C.

- Second cooling set point from external contact

r21: Represents the alternative to r01 if an associated digital input is closed (see parameter P08), between r13 and r14.

- Second heating set point from external contact

r22: Represents the alternative to r03 if an associated digital input is closed (see parameter P08), between r15 and r16.

- Select automatic changeover probe

r23: Select automatic changeover probe.
r23=0: automatic changeover disabled (to be selected when the micro ad is used, as in this case the changeover is managed completely by the terminal)
r23=1: automatic changeover enabled on probe B1
r23=2: automatic changeover enabled on probe B2
r23=3: automatic changeover enabled on probe B3
r23=4: automatic changeover enabled on probe B4
r23=5: automatic changeover enabled on probe B5
r23=6: automatic changeover enabled on probe B6
r23=7: automatic changeover enabled on probe B7
r23=8: automatic changeover enabled on probe B8

- Automatic changeover set point

r24: Automatic changeover set point, the change from cooling to heating occurs: by decreasing temperature until reaching the set point r24-r07, observing the reversing times.
The change for heating to cooling occurs: by increasing temperature until reaching the set point r24+r07, observing the reversing times.

The changeover is managed differently depending on the type of unit, water source (air/water and water/water) or air/air.
Air/water and water/water units:
Changeover is disabled if the selected probe (r23) is not configured or is a pressure probe. When changeover is enabled, in any cooling/heating inputs are ignored.
If the acqua terminal is used, set point r24 can be set on the terminal.
During defrost, automatic changeover is disabled. Only when the defrost ends can the operating mode change. The same is true for the autostart function in antifreeze (see A10).
At power on the controller operates in the previous mode if the probe reading is within the hysteresis 24-r07 and 24+r07, otherwise it starts with the new mode.

Example of changeover for air/water and water/water units

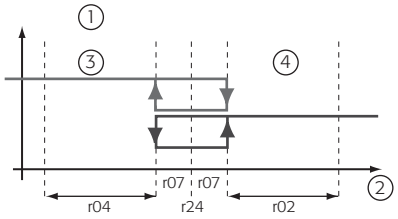


Fig. 5.b.j

Air/air units:
On this type of unit, the changeover probe decides both cooling-heating mode and the compressor steps, and as a consequence parameter R06 has no meaning when changeover is enabled.

If the changeover probe reading is out-of-range the probe alarm is activated and the outputs are deactivated.
If r07= 0 the differential for reversing the cycle is dictated by the first compressor step differential.

Key:
1. changeover;
2. changeover probe (r23);
3. heating;
4. cooling.

Example of changeover for air/air units

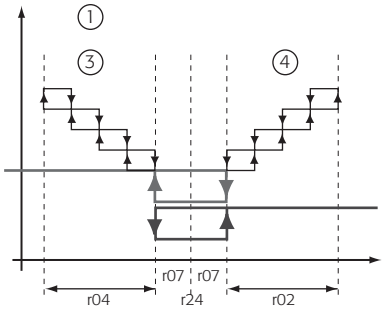


Fig. 5.b.k

- Outside temperature set point to stop compressors

r25: To avoid energy efficiency lower than electrical heating, the compressors are stopped if the outside temperature falls below r25, the differential to start them again is set to 1 degree. The heaters can then be activated according to the corresponding set point.
Setting 25 to "-40" (default value) disabled the function.

Example of compressor deactivation due to outside temperature

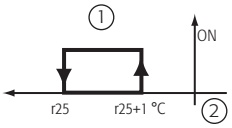


Fig. 5.b.l

- Cooling set point in dehumidification

r26: Alternative set point to r01 when the dehumidification function is active, as sent to the µC2SE by the terminal.
The differential remains the same as for chiller mode (r02).

- Buffer tank suppression (low load)

r27: The low load condition is determined when only one compressor is started and then is stopped after operating for less than the time set for parameter r28.
The settings are:
r27=0: the function is disabled;
r27=1: enabled only in chiller mode;
r27=2: enabled only in heat pump mode;
r27=3: enabled in chiller and heat pump modes.

- Minimum compressor on time to determine low load condition

r28: This parameter represents the minimum compressor on time below which the low load condition is determined. Whenever the compressor stops, the controller analyses the load status. If already in low load condition, the time considered by the controller for the analysis becomes "r28 x r29: r02" in chiller mode, or "r28 x r30 : r04" in heat pump mode.
This parameter also has the meaning of damper travel time when freecooling/heating is enabled. When the sum of the opening times reaches 2*damper travel time, the damper is no longer moved. The sum is reset when the damper is closing. Operation is the same in closing.

- Differential during the low load condition in chiller mode

r29: This parameter represents the new differential considered by the controller in chiller mode during the low load condition.
Specifically, r02 is replaced by r29.
This also has the meaning of freecooling differential.

- Differential during the low load condition in heat pump mode

r30: This parameter represents the new differential considered by the controller in heat pump mode during the low load condition.
Specifically, r04 is replaced by r30.
This also has the meaning of freeheating differential.

Key:
1. chiller;
2. chiller in low load;
3. heat pump;
4. heat pump in low load;
5. temperature.

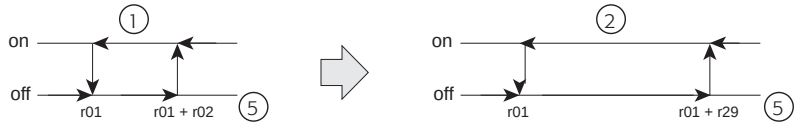


Fig. 5.b.m

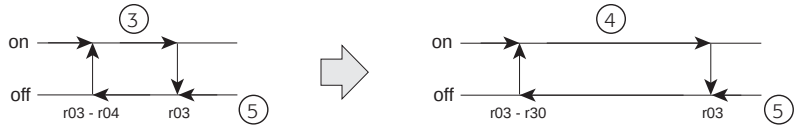


Fig. 5.b.n

- Heating compensation constant (mode Heat pump)

r31: Sets the coefficient that controls the heating compensation algorithm. In heating mode, if r31 is positive, the set point decreases as the outside temperature decreases (measured by the outside probe); if, on the other hand, r31 is negative, the set point increases as the outside temperature decreases. This maximum deviation of the set point from the set value is equal to parameter r18. See, for example, parameter r17.

- Set point B2 in hot start

r32: The fan, after reaching the hot start set point, cannot be stopped if at least one compressor is on or the electric heaters are operating.

- Hot start differential

r33: Hot start differential

Key:
1. outlet fan;
2. probe B2.

Hot keep/hot start example

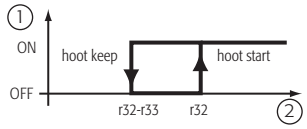


Fig. 5.b.o

- Enable freecooling/freeheating

r34: Sets the type of freecooling/heating with or without compressors
r34= 0: disabled
r34= 1: freecooling / without compressors / cooling only
r34= 2: freecooling / with compressors / cooling only
r34= 3: freeheating / without compressors / heating only
r34= 4: freeheating / with compressors / heating only
r34= 5: freecooling and freeheating / without compressors / freecooling in cooling only and freeheating in heating only
r34= 6: freecooling and freeheating / with compressors / freecooling in cooling only and freeheating in heating only
r34= 7: freecooling / without compressors / always
r34= 8: freecooling / with compressors / always
r34= 9: freeheating / without compressors / always
r34= 10: freeheating / with compressors / always
r34= 11: freecooling and freeheating / without compressors / always
r34= 12: freecooling and freeheating / with compressors / always
The purpose of the function is to exploit the outside climatic conditions when such can cool or heat the controlled environment by modulating the inlet of outside air into the room.
Freecooling can be enabled when: room T - outside T > freecooling differential (r29).

Key Fig. 5.b.p:
1. room T (B1);
2. room T - f/cool diff;
3. out T (e.g. B3);
4. outlet T (A1);
5. freecooling OFF;
6. time.

Key to Fig. 5.b.q:
1. freecooling;
2. room T - out T;
3. FC diff-hysteresis;
4. freecooling diff.

Freeheating can be enabled when: outside T - room T > freeheating differential (r30).

Key to Fig. 5.b.r:
1. out T;
2. room T;
3. out T - f/heat diff;
4. freeheating ON;
5. freeheating OFF
6. time.

The compressors can be used to support freecooling/freeheating if the latter are insufficient to provide for the thermal load. The proportional control band is respectively:
1. divided by the number of compressor steps, when freecooling/heating is disabled (Fig. 5.b.s);
2. managed with freecooling/heating operating and the compressors activated (Fig. 5.b.t).

Key to Fig. 5.b.s:
1. damper disabled;
2. set point;
3. utility temperature;
4. operation with 4 compressors;
5. proportional band.

Special cases:
1. If the compressors are on and freecooling is disabled, when the conditions for starting freecooling are reached, the controller will behave as follows:
   - the compressors are switched off, and can only be started again if the damper is 100% open, according to the control diagram shown in fig. 5.b.t
2. If control is performed with the compressors on and freecooling enabled, when the conditions for stopping freecooling are reached, the controller will behave as follows:
   - first the damper is closed for 110% of r28
   - then the control diagram is changed (from Fig. 5.b.t to Fig. 5.b.s)
3. When starting the controller, changing from cooling to heating and vice-versa, or switching from standby to ON, and with favourable of freecooling or freeheating conditions, the compressors are not started until the following conditions are satisfied::
   - the time r35 has elapsed
   - the sum of the opening times is equal to 2*r28.
4. When switching from On -> Standby, cooling/heating or vice-versa, the damper will be closed for 110% of r28.
5. When switching from On -> Stand by, cooling/heating or vice-versa, the control diagram changes back to the one shown in Fig. 5.b.t.

- Compressor deactivation time

r35: Compressor deactivation time when waiting for freecooling/heating.

- Damper cycle time

r36: Time used to calculate the duty cycle for opening and closing the damper.

Example of freecooling

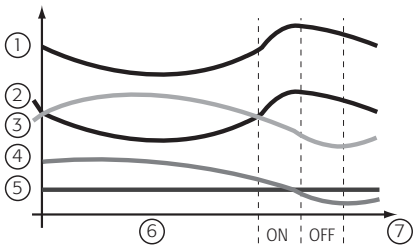


Fig. 5.b.p

Activation/Desactivation freecooling

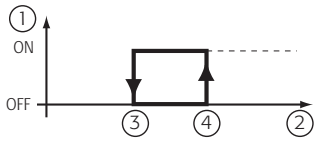


Fig. 5.b.q

Example of freeheating

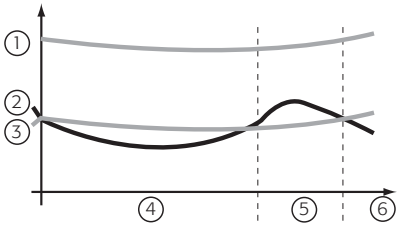


Fig. 5.b.r

Example of freeheating

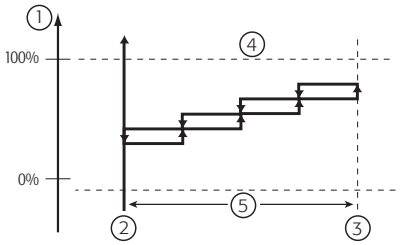


Fig. 5.b.s

Example of freecooling with the compressors on

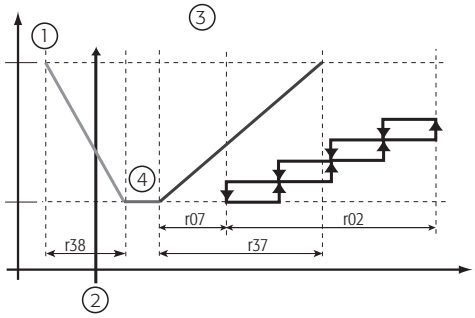


Fig. 5.b.t

Key to Fig. 5.b.t:
1. damper movement cycle time;
2. working set point;
3. cycle;
4. dead zone r02/4.

Duty cycle differential example

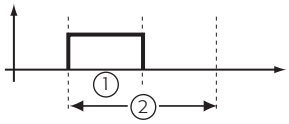


Fig. 5.b.u

- Damper opening duty cycle differential
r37: used to calculate the duty cycle for opening the damper.

- Damper closing duty cycle differential
r38: used to calculate the duty cycle for closing the damper.

Key:
1. opening time;
2. cycle time.

- Autotuning correction coefficient
r39: when changing the step in autotuning, prevents sudden variations in the controlled values from altering the control logic.

- Management of minimum damper opening
r40: enables and sets the management of the minimum damper opening.
r40= 0 the damper is always closed if control is not active
r40= 1 the damper is moved to the minimum opening when control is not active and only if the freecooling conditions are satisfied
r40= 2 the damper is moved to the minimum opening when control is not active, and only if the freeheating conditions are satisfied
r40= 3 the damper is moved to the minimum opening when control is not active, and only if the freecooling and freeheating conditions are satisfied
r40= 4 the damper is moved to the minimum opening when control is not active, and only if the freecooling and freeheating conditions are not true
r40= 5 the damper is moved to the minimum opening when control is not active, and only if the freeheating conditions are not true
r40= 6 the damper is moved to the minimum opening when control is not active, and only if the freecooling conditions are not true
r40= 7 the damper is moved to the minimum opening when control is not active, regardless of the freecooling and freeheating conditions
r40= 8 in cooling
r40= 9 in heating

- Minimum damper opening position
r41: defines the percentage of the damper travel time for the minimum damper opening position. The damper is moved to the minimum opening only when control is not active and after having been completely closed so as to reset the correct evaluation of the position following control, or alternatively directly to the minimum opening position set if the damper was previously in the completely open position.

- Disable compressors for low outside temperature in Freecooling
r42: defines the outside temperature threshold in freecooling mode below which the compressors are disabled, being considered unnecessary. Above the threshold, on the other hand, the compressors operate to support freecooling.

- Electric heater set point relationship
r43: defines the relationship between the absolute set point, considered as the activation threshold for the electric heaters, and the relative set point, that is, the activation threshold for the electric heaters referred o a working set point (set point sent by µAD, r01 or r04 or from time band) depending on the various applications and the mode, cooling or heating, and more precise:
r40= 0 electric heater set point A4, A8 and A11 on absolute values
r40= 1 electric heater set point A4 absolute value, A8 and A11 values relative to the working set point
r40= 2 electric heater set point A4 value relative to the working set point, A8 and A11 absolute values
r40= 3 electric heater set point A4, A8 and A11 values relative to the working set point

- Damper inactivity time in control
r44: represents the time, expressed in seconds, of inactivity between one opening or closing of the damper and the next. This time is used to adapt the dynamics of the system to the different applications, thus allowing the damper to reach a stable position, according to the load and the environment.

• Firmware parameters: (F-r*)
These parameters cannot be set (display only:
H96-H97: software version of Driver 1, 2;
H98: software version of the expansion;
H99: software version of the µC²SE controller.

Functions available with the clock board

The alarm log is only active and operative if the clock board is fitted. The terminal shows whether the clock board is fitted by displaying the following parameters:

- RTC hours
t01: RTC hours

- RTC minutes
t02: RTC minutes

- RTC day
t03: RTC day

- RTC month
t04: RTC month

- RTC year
t05: RTC year

The alarms are only shown on the local display.
The controller saves the significant events that stop (alarms) or limit (warnings) the operation of the unit. Up to 25 events can be saved, highlighting:
— Event code;
— Start hours;
— Start minutes;
— Start day;
— Start month;
— End hours;
— End minutes;
— End day;
— End month.

The log is accessed by pressing PRG+SEL for 5s and entering the password 44.
The alarms saved are complete, as they include both the start and end of the event.
The alarms can be deleted individually by pressing UP and DOWN for 5s when the desired event is displayed. If there are no alarms saved, "noH" is displayed. The table shows the possible alarms that can be saved:

SV	Display	Type
All. Circ. 1	HP1	High pressure circuit 1
All Circ. 2	HP2	High pressure circuit 2
All. Circ. 1	LP1	Low pressure circuit 1
All Circ. 2	LP2	Low pressure circuit 2
All. Gen.	TP	General thermal overload
All. Circ. 1	tC1	Thermal overload circuit 1
All. cir. 2	tC2	Thermal overload circuit 2
All. Gen	FL	Flow switch alarm
All. Sonde	E1	Probe B1 alarm
All. Sonde	E2	Probe B2 alarm
All. Sonde	E3*	Probe B3 alarm
All. Sonde	E4*	Probe B4 alarm

SV	Display	Type
All. Sonde	E5	Probe B5 alarm
All. Sonde	E6	Probe B6 alarm
All. Sonde	E7*	Probe B7 alarm7
All. Sonde	E8*	Probe B8 alarm
All. Gen.	ESP	Expansion error
All. Circ. 1	A1	Frost alarm circ. 1
All. Circ. 2	A2	Frost alarm circ. 2
All. Gen.	EHS	High power supply voltage
All. Evd 1	Ed1	EVD1 tLAN error
All. Evd 2	Ed2	EVD2 tLAN error
OFF	SH1	EVD1 overheat alarm
All. Evd 2	SH2	EVD2 overheat alarm

SV	Display	Type
All. Evd 1	EP1	EEPROM error EVD 1
All. Evd 2	EP2	EEPROM error EVD 2
All. Evd 1	ES1	Probe error EVD 1
All. Evd 2	ES2	Probe error EVD 2
All. Evd 1	EU1	Valve open error EVD 1 start
All. Evd 2	EU2	Valve open error EVD 2 start
All. Evd 1	Eb1	EVD 1 battery alarm
All. Evd 2	Eb2	EVD 2 battery alarm
All. Sonda µAD	Et	uAD terminal probe alarm

- Start hours for 2nd set point in cooling
t06 (I92): Hour when the second cooling set point starts(r21).

- Start minutes for 2nd set point in cooling
t07 (I93): Minutes when the second cooling set point starts (r21).

- End hours for 2nd set point in cooling
t08 (I94): Hour when the second cooling set point stops (r21).

- End minutes for 2nd set point in cooling
t09 (I95): Minutes when the second cooling set point stops (r21).

- Start hours for 2nd set point in heating
t10 (I96): Hours when the second heating set point starts (r22).

- Start minutes for 2nd set point in heating
t11 (I97): Minutes when the second heating set point starts (r22).

- End hours for 2nd set point in heating
t12 (I98): Hours when the second heating set point stops (r22).

- End minutes for 2nd set point in heating
t13 (I99): Minutes when the second heating set point stops (r22).

If a digital input is configured as the second set point from external contact (e.g. p08 = 13) the time bands are ignored. If a digital input is configured as the second cooling set point from external contact and heating set point from time band (e.g. p08 = 14), the cooling time bands are ignored.
The second set point from external contact input has priority over the second cooling set point from external contact and heating set point from time band.

- Start hours for low noise in cooling
t14: Start hours for low noise in cooling

- Start minutes for low noise in cooling
t15: Start minutes for low noise in cooling

- End hours for low noise in cooling
t16: End hours for low noise in cooling

- End minutes for low noise in cooling
t17: End minutes for low noise in cooling

- Start hours for low noise in heating
t18: Start hours for low noise in heating

- Start minutes for low noise in heating
t19: Start minutes for low noise in heating

- End hours for low noise in heating
t20: End hours for low noise in heating

- End minutes for low noise in heating
t21: End minutes for low noise in heating

6. TABLE OF ALARMS

Key to the table of alarms:
***:** if the probe is set for the compensation function, in the event of probe faults, the unit continues to operate.
ON*: if the expansion card is not present.
EVD 1= EVD400 connected to μC²SE (1st circ.)
EVD 2= EVD400 connected to the expansion (2nd circ.)

alarm display	alarm type	resetting	Compressor	pump	fan	heater	Valve	alarm	warning	superv. variable	superv. variab. description	variab. type
HP1	High pressure	Depends on P05	OFF C1-2	-	ON(60")	-	-	ON	-	41 (R)	Circuit 1 alarm	Digital
HP2	High pressure	Depends on P05	OFF C3-4	-	ON(60")	-	-	ON	-	42 (R)	Circuit 2 alarm	Digital
LP1	Low pressure	Depends on P05	OFF C1-2	-	OFF 1	-	-	ON	-	41 (R)	Circuit 1 alarm	Digital
LP2	Low pressure	Depends on P05	OFF C3-4	-	OFF 2	-	-	ON	-	42 (R)	Circuit 2 alarm	Digital
PL1	Capacity-control for low pressure circuit 1	Automatic	OFF C2	-	-	-	-	-	ON	-	Signal on display	-
PL2	Capacity-control for low pressure circuit 2	Automatic	OFF C4	-	-	-	-	-	ON	-	Signal on display	-
TP	General overload	Depends on P08	OFF	OFF	OFF	-	-	ON	-	45 (R)	General warning	Digital
tC1	Circuit 1 overload	Depends on P08	OFF C1-2	-	OFF 1	-	-	ON	-	41 (R)	Circuit 1 alarm	Digital
tC2	Circuit 2 overload	Depends on P08	OFF C3-4	-	OFF 2	-	-	ON	-	42 (R)	Circuit 2 alarm	Digital
LA	advice	Depends on P08	-	-	-	-	-	ON*	ON	50 (R)	General advice	Digital
FL	Flow controller alarm	Depends on P08	OFF	OFF	OFF	-	-	ON	-	45 (R)	General alarm	Digital
FLb	Backup pump warning	Automatic	-	-	-	-	-	-	ON	50 (R)	General advice	Digital
E1	Probe B1 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E2	Probe B2 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E3*	Probe B3 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E4*	Probe B4 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E5	Probe B5 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E6	Probe B6 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E7*	Probe B7 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
E8*	Probe B8 alarm	Automatic	OFF	OFF	OFF	OFF	-	ON	-	46 (R)	Probe alarm	Digital
Hc1-4	Hour warning C1-4	Automatic	-	-	-	-	-	-	ON	47 (R)	Compressor advice	Digital
EPr	EEPROM error during operation	Automatic	-	-	-	-	-	-	ON	50 (R)	General advice	Digital
EPb	EEPROM error at the start-up	Automatic	OFF	OFF	OFF	OFF	OFF	OFF	OFF	45 (R)	General alarm	Digital
ESP	Expansion Error	Automatic	OFF	OFF	OFF	OFF	OFF	ON	-	45 (R)	General alarm	Digital
EL1-2	Zero cross	Automatic	-	-	100%	-	-	ON*	ON	52 (R)	Fan advice	Digital
dF1-2	Defrosting error	Automatic	-	-	-	-	-	-	ON	50 (R)	General warning	Digital
d1-2	Defrost on circuit in question	-	-	-	-	-	-	-	-	-	Signal on display	-
Fd	Dirty filter warning	Automatic	-	-	-	-	-	-	-ON	-	Signal on display	-
A1	Frost alarm circ. 1	Depends on P05	OFF C1-2	-	OFF 1	-	-	ON	-	41 (R)	Circuit 1 alarm	Digital
A2	Frost alarm circ. 2	Depends on P05	OFF C3-4	-	OFF 2	-	-	ON	-	42 (R)	Circuit 2 alarm	Digital
Ht	High temperature	Automatic	-	-	-	-	-	ON*	ON	51 (R)	Temperature advice	Digital
Lt	Low ambient temp.	Depends on P05	-	-	-	-	-	ON*	ON	51 (R)	Temperature advice	Digital
AHt	High temperature at the start-up	Automatic	OFF	-	OFF	OFF	-	-	ON	50 (R)	General warning	Digital
ALt	Low temperature at the start-up	Automatic	OFF	-	OFF	OFF	-	-	ON	50 (R)	General warning	Digital
ELS	Low supply voltage	Automatic	-	-	-	-	-	-	ON	50 (R)	General warning	Digital
EHS	High supply voltage	Automatic	OFF	OFF	OFF	OFF	OFF	OFF	OFF	45 (R)	General alarm	Digital
tEr	Terminal communication error	Automatic	OFF	OFF	OFF	OFF	OFF	ON	-	-	Signal on display	-
Ed1	EVD 1 tLAN error	Automatic	OFF C1-2	-	OFF	-	-	ON	-	43 (R)	EVD 1 warning	Digital
Ed2	EVD 2 tLAN error	Automatic	OFF C3-4	-	OFF	-	-	ON	-	44 (R)	EVD 2 warning	Digital
SH1	EVD 1 superheat alarm	-	OFF C1-2	-	OFF-	-	-	ON	-	43 (R)	EVD 1 warning	Digital
SH2	EVD 2 superheat alarm	-	OFF C3-4	-	OFF-	-	-	ON	-	44 (R)	EVD 2 warning	Digital
nO1	MOP 1 warning	Automatic	-	-	-	-	-	-	ON	48 (R)	EVD 1 advice	Digital
nO2	MOP 2 warning	Automatic	-	-	-	-	-	-	ON	49 (R)	EVD 2 advice	Digital
LO1	LOP 1 warning	Automatic	-	-	-	-	-	-	ON	48 (R)	EVD 1 advice	Digital
LO2	LOP 1 warning	Automatic	-	-	-	-	-	-	ON	49 (R)	EVD 2 advice	Digital
HA1	High inlet temperature warning circ.1	Automatic	-	-	-	-	-	-	ON	48 (R)	EVD 1 advice	Digital
HA2	High inlet temperature warning circ. 2	Automatic	-	-	-	-	-	-	ON	49 (R)	EVD 2 advice	Digital
EP1	EVD 1 Eeprom error	Automatic	OFF C1-2	-	OFF-	-	-	ON	-	43 (R)	EVD 1 warning	Digital
EP2	EVD 2 Eeprom error	Automatic	OFF C3-4	-	OFF-	-	-	ON	-	44 (R)	EVD 2 warning	Digital
ES1	EVD 1 probe error	Automatic	OFF C1-2	-	OFF-	-	-	ON	-	43 (R)	EVD 1 warning	Digital
ES2	EVD 2 probe error	Automatic	OFF C3-4	-	OFF-	-	-	ON	-	44 (R)	EVD 2 warning	Digital
EU1	Open valve EVD 1 error at the start-up	Automatic	OFF C1-2	-	OFF	-	-	ON	-	43 (R)	EVD 1 warning	Digital
EU2	Open valve EVD 2 error at the start-up	Automatic	OFF C3-4	-	OFF	-	-	ON	-	44 (R)	EVD 2 warning	Digital
Eb1	EVD 1 battery alarm	Automatic	OFF C1-2	-	OFF	-	-	ON	-	43 (R)	EVD 1 warning	Digital
Eb2	EVD 2 battery alarm	Automatic	OFF C3-4	-	OFF	-	-	ON	-	44 (R)	EVD 2 warning	Digital
L	Low load warning	Automatic	-	-	-	-	-	-	-	-	Signal on display	-
Ed1	tLan EVD 1 communication error	Automatic	OFF C1-2	-	OFF	-	-	ON	-	43 (R)	EVD 1 warning	Digital
Ed2	tLan EVD 2 communication error	Automatic	OFF C3-4	-	OFF	-	-	ON	-	44 (R)	EVD 2 warning	Digital
PH1	Low pressure circ. 1 warning	-	-	-	-	-	-	-	-	-	Signal on display	-
PH2	Low pressure circ. 2 warning	-	-	-	-	-	-	-	-	-	Signal on display	
SUL	Low outlet temperature warning	-	-	-	-	-	-	-	-	-	Signal on display	
CP1	compressor 1 alarm	Automatic	OFF C1	-	-	-	-	ON	-	25 (R)	Compr. error alarm	Digital
CP2	compressor 2 alarm	Automatic	OFF C2	-	-	-	-	ON	-	25 (R)	Compr. error alarm	Digital
CP3	compressor 3 alarm	Automatic	OFF C3	-	-	-	-	ON	-	25 (R)	Compr. error alarm	Digital
CP4	compressor 4 alarm	Automatic	OFF C4	-	-	-	-	ON	-	25 (R)	Compr. error alarm	Digital

Table 6.a

Note: The warning relay differs from the alarm relay as it is only activated for warnings, that is, signals only, which have no direct effect on the operation of the unit, and the display does not show the alarm symbol (bell).

Compressor

N.B. The alarm relating to the circuit with the fault must not interact with the operation of the other circuit, as long as the condenser is not shared in common.

HP1: High pressure circuit 1
The alarm is detected irrespective of the status of the pump and the compressors. The compressors corresponding to circuit 1 are immediately stopped (ignoring the set protection times), the buzzer and alarm relay are activated, and the display starts flashing. The fans corresponding to the condenser in circuit 1 are activated at maximum speed for 60 s, so as to oppose the alarm situation, after which they are switched OFF. This alarm may also be generated when the high pressure limit is exceeded (valid only when the pressure transducer is fitted) set by the parameter P18, which to be enabled must be greater than 3.0 bars, due to the corresponding hysteresis.

HP2: High pressure circuit 2
As for HP1 but relating to circuit 2.

LP1: Low pressure circuit 1
The alarm depends on P15, P7 and P3.
P15= 0, P07= 0: the alarm is detected only if the compressors in circuit 1 are ON, and after the time P03 from when the compressors started, otherwise it is immediate.
P15= 1, P07= 0: the alarm is detected even if the compressors in circuit 1 are off, after the time P03.
P15= 0, P07= 1: the alarm is detected only if the compressors in circuit 1 are ON, and after the time P03 from when the compressors started, otherwise it is immediate, and if in heat pump mode, is activated for pressure values less than 1 bar.
P15= 1, P07= 1: the alarm is detected also if the compressors in circuit 1 are Off, after the time P03, and if in heat pump mode, is activated for pressure values lower then 1 bar. The hysteresis for this alarm is 1 bar.

LP2: Low pressure circuit 2
As for LP1 but relating to circuit 2.

PL1: Capacity-control for low pressure circuit 1
Indicates that circuit 1 on the unit is operating in capacity control mode, due to low pressure (heat pump only).

PL2: Capacity-control for low pressure circuit 2
As for PL1, but for circuit 2.

PH1: Compressor part load circuit 1
Indicates the part load of circuit 1 due to high pressure. This situation is signalled by the message "PH1" on the display the activation of the warning relay.

PH2: Compressor part load circuit 2
As for PC1, but for circuit 2.

tP: General thermal overload
The alarm is detected irrespective of the status of the pump and the compressors. The compressors, the pumps and fans stop (without observing the protection times) or are inhibited from starting, the alarm relay is activated, the display flashes the corresponding message, and the LED flashes. It can be reset either manually or automatically (see par. P08, P09, P10, P11, P12, P13).

tC1: Thermal overload circuit 1
As for tP but relating to circuit 1

tC2: Thermal overload circuit 2
As for tC1 but relating to circuit 2.

LA: generic warning
This represents a generic warning that appears on the display, from digital input, without modifying the operation of the unit. With the 1st circuit module only, the alarm relay is activated, while with the expansion card the warning relay can be used.

FL: flow alarm
This alarm is detected only if the pump is ON (excluding the delays when starting P01 and in steady operation P02), irrespective of the status of the compressor. All of the outputs are disabled: pump, compressor (without observing the OFF times), condenser fan, and the buzzer sounds, the alarm relay is activated and the display flashes. The presence of the utility water pump must be enabled (H5≠0). It can be reset either manually or automatically (see P08, P09, P10, P11, P12, P13).

FLb: Backup pump warning
The warning activates the warning relay and displays the message "FLb"; reset is manual. This indicates the operation of the backup pump (if present) due to a probable fault on the main pump, suggesting that maintenance is required. If the flow alarm features automatic reset, the controller will make 10 attempts to re-start the pumps, after which the FL alarm will replace FLb. If the flow alarm features manual reset, when first activated the controller will display the alarm FLb, switching over the pumps; when activated again the FL alarm will replace FLb.

E1 to E8: probe error detected even when the unit is in Standby
The presence of a probe alarm causes the deactivation of the compressor, the condenser fans, the pump (outlet fan in AIR/AIR units) and the heaters (so as to avoid fires in the air/air units); the buzzer and alarm relay are activated, and the display starts flashing. If the probe has a compensation function, the unit will continue a operate correctly, with the exception of the corresponding function, and the warning relay will be activated and a message shown on the display, from E1 to E8 for probes from B1 to B8.

Hc1 to Hc4: compressor operating hour limit exceeded warning
When the number of operating hours for the compressor exceeds the maintenance threshold (as default equal to zero, and consequently the function is disabled), the maintenance request signal is activated. The buzzer and the alarm relay are not activated, however the warning relay is activated (with the expansion card fitted).

Epr, EPb: EEPROM error
A problem has occurred when saving the parameters to the unit's non-volatile memory (EEPROM); in the event of an Epr error, the μC²SE continues to perform the control functions with the data present in the volatile memory (RAM), where there is a physical copy of all of the data. After the first power failure the configuration will be lost. The buzzer and the alarm relay are not activated. If the occurs when starting the unit, "EPb", the controller will not operate.

ESP: communication error with expansion card
If the controller loses communication with the expansion card, the entire system will be stopped to avoid adversely affecting the unit. The alarm relay is activated and the display will show the message, with the red LED on steady.

EL1-2: warning, zero crossing error circuit 1-2
If the controller detects errors in the power supply, control may be lost over the fan speed. In this case, the display will show a warning, and the fans will be controlled at maximum speed. The alarm is reset automatically, so as to not affect the operation of the unit. If the expansion card is used, the warning relay is activate)

dF1-2: warning, end defrost circuit 1-2 due to maximum time
If the defrost ends after the maximum time when end defrost by temperature or from external contact has been selected, the unit displays the text dF1 for circuit 1 or dF2 for circuit 2.
The message is cancelled using the delete alarm procedure or when the next correct defrost cycle is completed. The buzzer and the alarm relay are not activated. If the expansion card is used, the warning relay is activated (if used).

A1: antifreeze alarm outlet limit circuit 1
The alarm is only detected in water chillers (H01= 2, 3, 4, 5 or 6) by the evaporator water outlet probe (B2/B6) or, if the electronic expansion driver (EVD) is connected to the tLAN, based on the evaporation temperature sent by the driver. The evaporator water outlet temperature is compared against the threshold A01, while the evaporation temperature is compared against the threshold A14.
The compressors in circuit 1 and the condenser fans in circuit 1 are immediately stopped, the buzzer and alarm relay are activated, and the display starts flashing. If the μC²SE is in Standby, the alarm condition is not detected, and only the heaters are managed. Reset depends on parameter P5:

1. in the event of automatic reset, the unit restarts automatically if the temperature is above the value
   A01+A02 or A14+A02.
2. in the event of manual reset, the unit can restart manually even if the alarm is active.

After the time A03, if the alarm persists the unit will stop again.
For air/air units the parameter becomes the antifreeze-outlet limit alarm set point. If the outlet limit is active, the freecooling damper is forced closed and the message SUL is shown on the display.

A2: antifreeze alarm circuit 2
As for A1 but relating to circuit 2

Ht: high temperature warning
This alarm is activated when the threshold is exceeded (read by B1), set for the parameter P16. It is delayed at power ON by the parameter P17 and causes the activation of the alarm relay and the buzzer, without deactivating the outputs. It is reset automatically when conditions that caused the alarm are no longer present.

Lt: low temperature warning
For direct expansion units (H01=0, 1) the alarm is used to measure a low room temperature using probe B1 or B2 (depending on par. A06). The alarm may be reset manually or automatically, and depends on the parameter P05. If the expansion is present, the corresponding relay is activated; in the event of μC²SE module only, the alarm relay will be used.

AHt: high temperature warning when starting the system
The advice does not activate the relay, and displays the message "AHt".

ALt: low temperature warning when starting the system
The advice does not activate the relay, and displays the message "ALt".

ELS/EHS: warning, low/high power supply alarm
If the power supply voltage is too low or too high, the corresponding message is displayed.
In these cases, the correct operation of the μC²SE is no longer guaranteed. In the low voltage conditions only the requests to deactivate the loads are effected. Any start-up requests remain pending. The high voltage condition involves the deactivation of all the energised relays.

L: Low load warning
The warning does not activate the relay and displays the message " L "; reset is automatic.

tEr: terminal communication error
This alarm is only shown if μC²SE has been connected to a terminal. The alarm is generated a fixed time (30 s) after μC²SE loses contact with the terminal. In this case the unit is disabled for safety reasons.

D1: defrost signal circuit 1
When the defrost is on circuit 1, the display shows the message D1.

D2: defrost signal circuit 2
When the defrost is on circuit 2, the display shows the message D2.

Fd: dirty filter warning
This warning is only shown if the temperature difference between the exchanger inlet and outlet is higher than parameter A12.

Driver
All the driver alarms on the μC²SE that stop the unit feature automatic reset. Consequently, the possibility to select the automatic resetting of the entire system must be selected for the drivers by setting the corresponding parameters. The μC²SE can send the Go Ahead command according to the normal procedure for resetting the alarms from the keypad.

Ed1: tLan communication error with Driver 1
The alarm is generated after a fixed time (5 s) from when the μC²SE loses contact with Driver 1. In this case, circuit 1 is disabled for safety reasons.

Ed2: tLan communication error with Driver 2 (expansion card)
As for Ed1, but relating to driver 2.

SH1: low superheat alarm circuit 1
The low superheat alarm for circuit 1, after a fixed time (5 s), inhibits the circuit 1 for safety reasons. The risk is that the compressors will flood.

SH2: low superheat alarm circuit 2
As for SH1, but relating to driver 2

nO1: MOP warning (maximum operating pressure) circuit 1
The warning appears on the display and, if the expansion card is fitted, the corresponding relay is activated.

nO2: MOP warning (maximum operating pressure) circuit 2
The warning appears on the display and, if the expansion card is fitted, the corresponding relay is activated.

LO1: LOP warning (lowest operating pressure) circuit
The warning appears on the display and, if the expansion card is fitted, the corresponding relay is activated.

LO2: LOP warning (lowest operating pressure) circuit 2
As for LO1, but relating to driver 2

HA1: high evaporator temperature warning circuit 1
The warning appears on the display and, if the expansion card is fitted, the corresponding relay is activated.

HA2: high evaporator temperature warning circuit 2
As for HA1, but relating to driver 2.

EP1: EEPROM error driver 1
The circuit 1 is disabled for safety reasons, as the status of Driver 1 is not known.

EP2: EEPROM error driver 2
As for EP1, but relating to driver 2.

ES1: probe error driver 1
The circuit 1 is disabled for safety reasons, as the status of Driver 1 is not known.

ES2: probe error driver 2
As for ES1, but relating to driver 2.

EU1: EVD 1 error, valve open when starting
If when starting the system the Driver detects that the valve is still open, an alarm is sent to the μC²SE that stops the compressors and the fans in the corresponding circuit.

EU2: EVD 2 error, valve open when starting
As for EU1, but relating to EVD 2.

Eb1: EVD 1 battery alarm
The EVD 1 battery alarm stops the compressors from starting so as to prevent the risk of liquid returning to circuit 1, and disables the corresponding fans.

Eb2: EVD 2 battery alarm
The EVD 2 battery alarm stops the compressors from starting so as to avoid the risk of liquid returning to circuit 2, and disables the corresponding fans.

7.1 Connection diagram

Below is the connection diagram for the µC²SE.

Panel version

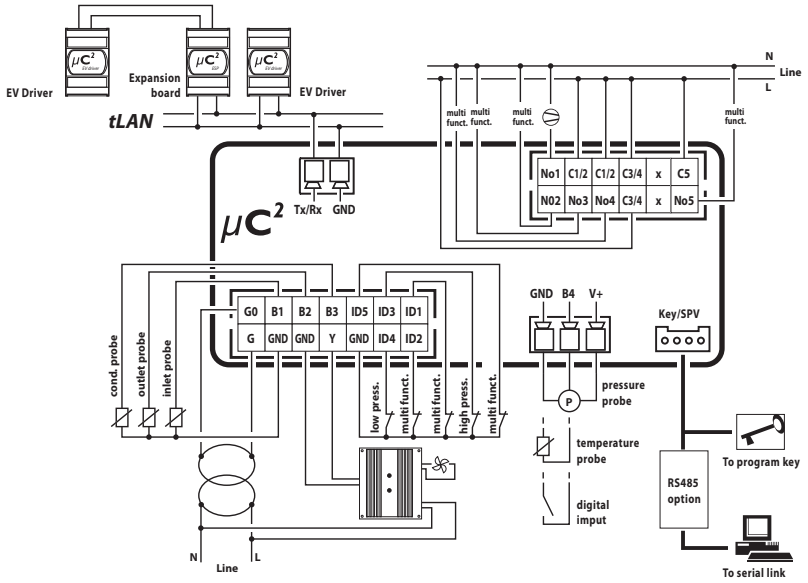


Fig. 7.a

I/O layout

µC²SE	Description
B1	Control probe (Evaporator inlet/ambient)
B2	Protection probe (evaporator outlet/outlet)
B3	Condenser/outside temperature probe
B4 (universal)	Condenser pressure probe
ID1*	Flow switch – thermal overload circuit 1 – cooling/heating – end defrost circuit 1 – step 1 condensing unit – second set point
ID2*	Flow switch – thermal overload 1 circuit – cooling/heating – end defrost circuit 1 – step 2 condensing unit – second set point
ID3	High pressure circuit 1
ID4	Low pressure circuit 1
ID5	Remote ON/OFF – reverse cycle condensing unit if reversible
Y1	Ramp circuit 1 (condenser)
C1/2-NO1	Compressor 1
C1/2-NO2	Heater or reversing valve in 1st circuit
C3/4-NO3	Fan 1/evaporator pump
C3/4-NO4	Compressor 2 (capacity-control compressor 1)
C5-NO5	Alarm or reversing valve

Table 7.a

Expansion	Description
B5	Output probe in common with 2 evaporators (only with 2 circuits)
B6	Circuit 2 protection probe (2nd evaporator output)
B7	2nd condenser temperature probe
B8 (universal)	2nd condenser pressure probe
ID6**	Flow switch – thermal overload circuit 2 – end defrost circuit 2 – step 4 condensing unit – second set point
ID7**	Flow switch – thermal overload circuit 2 – end defrost circuit 2 – step 4 condensing unit– second set point
ID8	High pressure circuit 2
ID9	Low pressure circuit 2
ID10	
Y2	Ramp circuit 2 (condenser)
C6/7-NO6	Compressor 3 (1 in 2nd circuit)
C6/7-NO7	Heater or reversing valve in 2nd circuit
C8/9-NO8	Fan 2/condenser pump/backup
C8/9-NO9	Compressor 4 (capacity-control compressor 2) or reversing valve circuit 1 or reversing valve circuit 2
C10-NO10	Warning or reversing valve circuit 2

Table 7.b

*= Any of the options for P08 can be selected (see Table 5.11)
**= Any of the options for P08 can be selected, except for E/I and E/I delay.

7.2 Expansion card

This device allows the µC²SE to manage the second refrigerant circuit on chillers, heat pumps and condensing units with up to 4 hermetic compressors.
The following figure shows the connection diagram for the µC²SE expansion card, code MCH200002*.

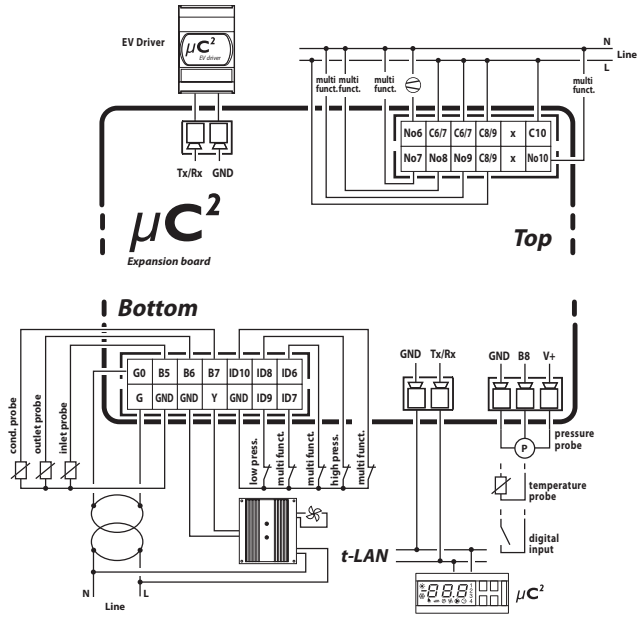


Fig. 7.b

NOTE: The expansion features two LEDs on the main board (to see these, remove the top or bottom door), which display its status by the following messages:

	ON	Flashing
green LED	Board powered	Board powered and serial communication with µC²SE in progress
red LED		1 flash: Probe fault alarm
		2 flashes: Zero crossing alarm (mains frequency not detected)
		3 flashes: Serial communication alarm with EVD
		4 flashes: Serial communication alarm with µC²SE

Table 7.c

The alarms are displayed in sequence and are separated from each other by pauses.

7.3 EVD4*: Electronic expansion valve driver

This device is used to control electronic expansion valves. The device is connected to the µC²SE via a tLAN serial line. The condensing pressure probe must be connected to the µC²SE, which then sends the reading to the driver.

Nota: for all other information on the connections, refer to the EVD4* driver manual.

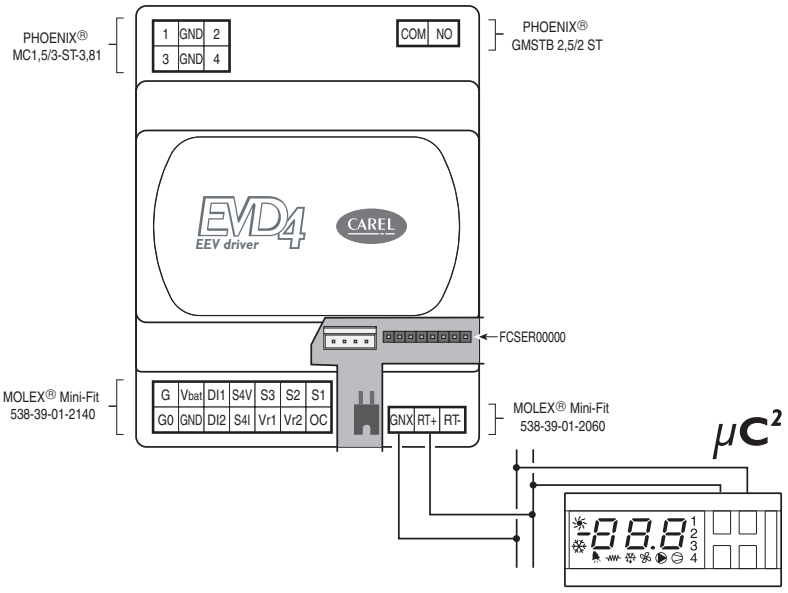


Fig. 7.c

7.4 Fan speed control board (code MCHRTF*)

The phase cutting boards (code MCHRTF****) are used to control the speed of the condenser fans.

IMPORTANT: The power supply to the µC²SE (G and G0) and the MCHRTF**** board must be in phase. If, for example, the power supply to the µC²SE system is three-phase, make sure that the primary of the transformer supplying the µC²SE board is connected to the same phase that is connected to terminals N and L on the speed control board; therefore, do not use 380 Vac/24 Vac transformers to supply the controller if the phase and neutral are used to directly power the speed control boards.
Connect the earth terminal (where envisaged) to the earth in the electrical panel.

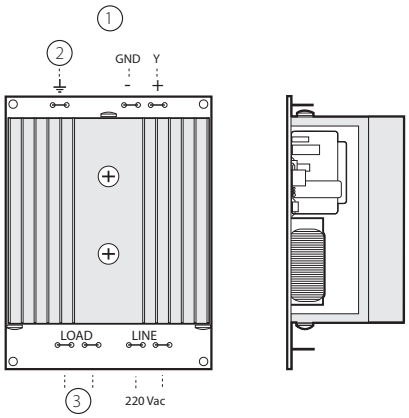


Fig. 7.d

Key:
1. to µchiller;
2. earth;
3. to motor.

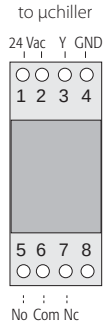


Fig. 7.e

7.5 Fan ON/OFF control board (code CONVONOFF0)

The relay boards (code CONVONOFF0) are used for the ON/OFF management of the condenser fans.
The control relay has a switchable power rating of 10 A at 250 Vac in AC1 (1/3 HP inductive).

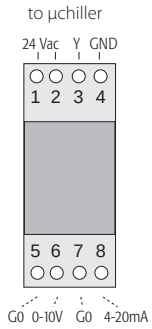


Fig. 7.f

7.6 PWM to 0 to 10Vdc (or 4 to 20 mA)conversion board for fans (code CONV0/10A0)

The CONV0/10A0 boards convert the PWM signal at terminal Y on the µC²SE to a standard 0 to 10 Vdc (or 4 to 20 mA) signal. The FCS series three-phase controllers can be connected to the µC²SE without using this module.

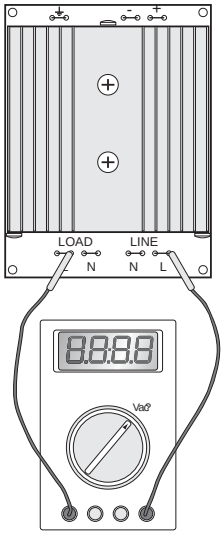


Fig. 7.g

7.7 Minimum and maximum fan speed calculation

This procedure should only be performed when the fan speed control boards are sued (code MCHRTF*).
it must be stressed that if the ON/OFF modules (code CONVONOFF0) or alternatively the PWM to 0 to 10 V converters (code CONV0/10A0) are used, parameter F03 should be set to zero, and parameter F04 to the maximum value.
Given the different types of motors existing on the market, the user must be able to set the voltages supplied by the electronic board corresponding to the minimum and maximum speeds. In this regard (and if the default values are not suitable), proceed as follows:

- set parameter F02= 3 and set F03 and F04 to zero;
- the condenser control set point (evaporator in HP mode) has been modified to take the output signal to the maximum value (PWM);
- increase F04 until the fan operates at a sufficient speed (make sure that, after having stopped it, it can rotate freely when released);
- "copy" this value to parameter F03; this sets the voltage for the minimum speed;
- connect a voltmeter (set for AC, 250V) between the two "L" terminals (the two external contacts);
- increase F04 until the voltage stabilises at around 2 Vac (inductive motors) or 1.6, 1.7 Vac (capacitive motors). Once the value has been found, it will be evident that even when increasing F04 the voltage no longer decreases. In any case do not increase F04 further so as to avoid damaging the motor;
- restore the correct condenser set point (evaporator in HP mode).

The operation is now completed.

7.8 Programming key (code PSOPZKEYA0)

The programming keys PSOPZKEY00 and PSOPZKEYA0 for CAREL controllers are used for copying the complete set parameters for μC²SE.
The keys must be connected to the connector (4 pin AMP) fitted on the controllers, and can work with the instruments ON or OFF, as indicated in the operating instructions for the specific controller.
The two main functions (upload/download) that can be selected through two dip-switches (which are placed under the battery cover). They are:

- Loading to the key the parameters of a controller (UPLOAD);
- Copying from the key to one or more controllers (DOWNLOAD).

Fig. 7.h

Fig. 7.i

Warning: the copying of the parameters is allowed only between instruments with the same code. Data loading operation to the key is always allowed. To make identification of the key easier CAREL has inserted a label on which you can describe the loaded programming or the machine to which you are referring.

IMPORTANT NOTE: the key can be used only with controllers μC²SE that have the same Firmware version.

UPLOAD - copying the parameters from an instrument to the key:

- open the rear hatch of the key and place the two dip-switches in the OFF position (see Fig. 7.j.a). Close the hatch;
- connect the key to the connector of the instrument;
- press the button on the key and keep it pressed, checking the LED signal sequence: at first it is red, after a few seconds it becomes green;
- if the sequence of signals is as indicated above, the copying operation has been completed correctly (green LED ON), the button can be released and the key disconnected from the instrument; in case of different signals: if the green LED doesn't turn on or if there are some flashes, there's a problem. Refer to the corresponding table for the meaning of the signals.

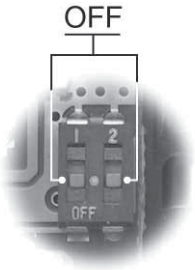


Fig. 7.j.a

DOWNLOAD - copying the parameters from the key to the instrument:

- open the rear hatch of the key and place the dip-switch n. 1 in the OFF position and the dip-switch n. 2 in the ON position (see Fig. 7.j.b). Close the hatch;
- connect the key to the connector of the instrument;
- press the button on the key and keep it pressed, checking the LED signal sequence: at first it is red, after a few seconds it becomes green;
- if the sequence of signals is as indicated above, the copying operation has been completed correctly (green LED ON), the button can be released; after a few seconds the LED turns off and the key can be disconnected from the instrument;
- in case of different signals: if the green LED doesn't turn on or if there are some flashes there's a problem. Refer to the corresponding table for the meaning of the signals.

The operation takes maximum 10 seconds to complete. If after this period the completed operation signal hasn't yet appeared, i.e. the green LED ON, try releasing and pressing the button again. In the event of flashes, refer to the corresponding table for the meaning of the signals.

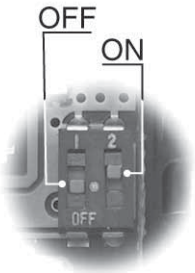


Fig. 7.j.b

LED signal	error	meaning and solution
red LED flashing	Flat batteries at the beginning of the copying	The batteries are flat, the copying cannot be carried out. Replace the battery (only on PSOPZKEY00).
green LED flashing	Flat batteries at the end of the copying (only on PSOPZKEY00)	The copying operation has been carried out correctly but at the end of the operation the voltage of the batteries is low. It is advisable to replace the batteries.
Alternate red/ green LED flashing (orange signal)	Not compatible instrument	The setup of the parameters cannot be copied since the model of the connected parameters is not compatible. Such error happens only with the DOWNLOAD function, check the controller code and make the copy only on compatible codes.
red and green LEDs ON	Copying error	Error in the copied data. Repeat the operation; if the problem persists, check the batteries and the connections of the key.
red LED always ON	Data transmission error	The copying operation hasn't been completed because of serious data transmission or copying errors. Repeat the operation, if the problem persists, check the batteries and the connections of the key.
LEDs OFF	Batteries disconnected	Check the batteries (for the PSOPZKEY00)
	Power supply not connected	Check the power supply (for the PSOPZKEYA0)

Table 7.d

Technical specifications

Power supply to the PSOPZKEY00	- Use three 1.5 V 190 mA batteries (Duracell D357H or equivalent)
	- Maximum current supplied 50 mA max.
Power supply to the PSOPZKEYA0	- switching power supply: Input 100 to 240 V~; (-10%, +10%); 50/60 Hz; 90 mA. Output: 5 Vdc; 650 mA
Operating conditions	0T50°C r.H. <90% non-condensing
Storage conditions	-20T70°C r.H. <90% non-condensing
Case	Plastic, dimensions 42x105x18 mm including prod and connector Figs. 1 and 2

Table 7.e

(Here we have dealt only with the base functions of the instrument. For the remaining specific functions, see the manual of the instrument that is being used).

Fig. 7.k

7.9 RS485 serial options

RS485 serial option for µC²SE panel version (code MCH2004850)

The MCH2004850 serial option is used to connect the µC²SE controller to a supervisor network via a standard RS485 serial line.

This option uses the input normally associated with the programming key, which has the dual function of key connector/serial communication port.

Fig. 7.l

7.10 Terminals

The µC²SE features the following user interfaces:

Remote terminal

The remote terminal allows the complete configuration of the µC2SE from a remote position. The buttons and indications on the display faithfully reproduce the µC2SE user interface. In addition, PlantVisor can be connected to the remote terminal using the special accessory.

Product code:

MCH200TP00 for panel installation

MCH200TW00 for built-in assembly

For further information see the instruction sheet +050001065.

µAD

µAD is the µC2SE room terminal.

This terminal, fitted with built-in temperature and humidity probes, controls the temperature-humidity conditions in the environment where its is installed, interacting with the units controlled by the µC2SE.

The µAD can be used to set time bands, the temperature and humidity set point, switch the system on/off and change operating mode simply and intuitively.

Product code:

ADMA001000: with NTC probe

ADMB001010: with NTC probe, RTC and buzzer

ADMG001010: with NTC and humidity probe, RTC and buzzer

ADMH001010: with NTC and humidity probe, RTC, buzzer and backlighting

Fig. 7.m

For further information see the instruction sheet +05000750 and the manual +030220465.

µAM

µAM is the µArea controller compatible with the µC2SE.

This can control up to 10 fan coils (fitted with the e-droFAN electronic controller). By analysing the temperature-humidity conditions in the different rooms, µAM optimises the temperature of the water produced by the chiller/HP, improving power consumption, performance and comfort.

In addition, the µAM centralises the data, such as set point, heat/cool mode and on/off for the individual fan coil and the entire system, including time bands.

Fig. 7.n

Product code:

ADEC001010: with NTC probe, RTC, buzzer and backlighting

ADEH001010: cwith NTC and humidity probe, RTC, buzzer and backlighting

For further information see the instruction sheet +050000740 and the manual +030220460.

8. DIMENSIONS

The following are the mechanical dimensions of each component in the µC²SE controller; all the values are expressed in millimetres.

Note: the dimensions include the free connectors inserted.

MCH200000* µC²SE panel mounting version

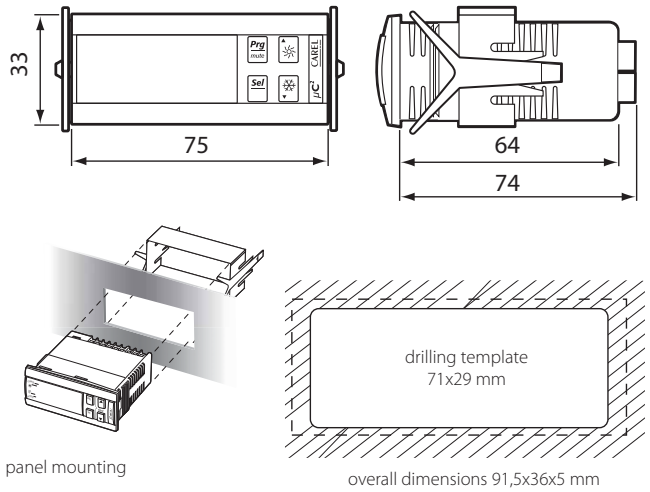


Fig. 8.a

Expansion board for µC²SE

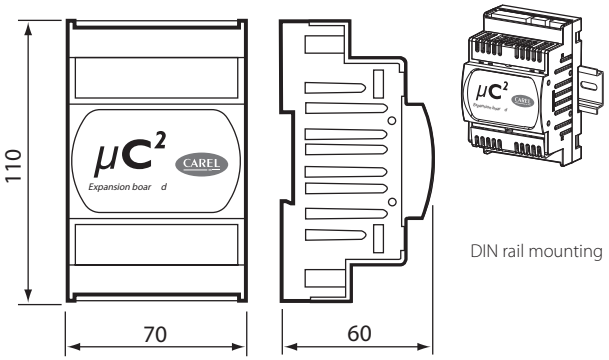


Fig. 8.b

CONVONOFF0 and CONV0/10 A modules

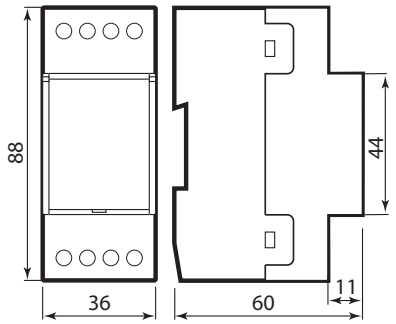


Fig. 8.c

RS485 serial card: codeMCH2004850

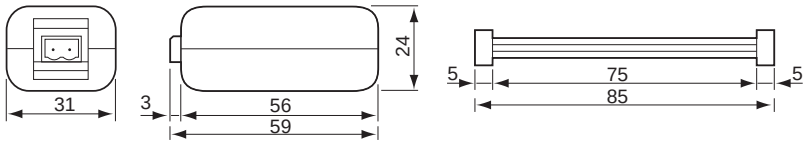


Fig. 8.d

Model	A (component side)	B	C	D	E
MCHRTF04C0	43	100	40	50	107
MCHRTF08C0	75	100	58	82	107
MCHRTF12C0	75	100	58	82	107

Note: the version with screw teminals code MCHRTF*D0 is available on request

Table 8.a

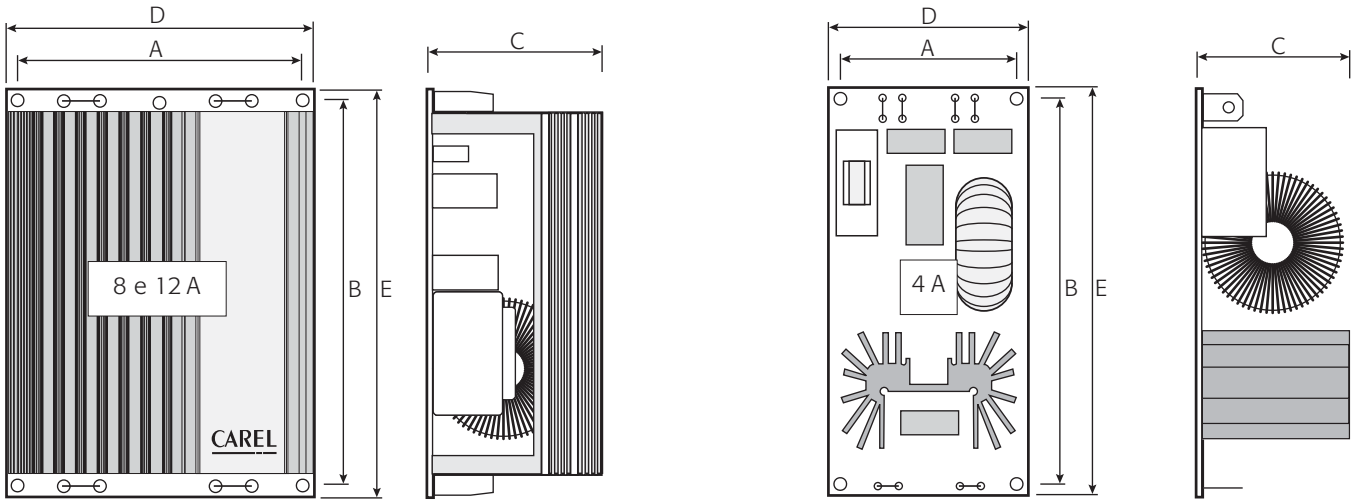


Fig. 8.e

Model
MCHRTF10C0

Table 8.b

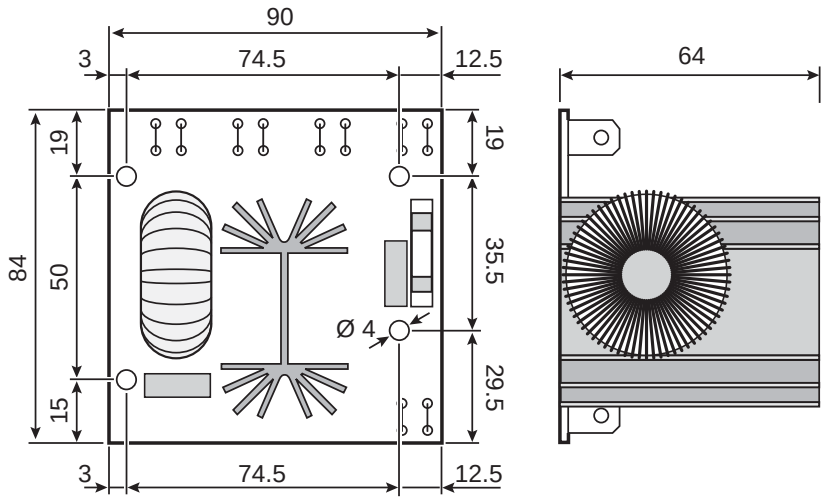


Fig. 8.f

Description	Code
µC²SE single circuit, 2 compressors, panel mounting	MCH2001030
µC²SE single circuit, 2 compressors, panel mounting (20 pcs. multiple package)	MCH2001031
µC²SE expansion board for 2nd. circuit maximum 4 compressors	MCH2000020
µC²SE expansion board for 2nd. circuit maximum 4 compressors (10 pcs. multiple package)	MCH2000021
RS485 optional board for µC²SE panel version	MCH2004850
Programming key for µC²SE	PSOPZKEY00
ON/OFF fan card (only screw terminals)	CONVONOFF0
PWM - 0 to 10 V fan card (only screw terminals)	CONV0/10A0
Temperature probes for regulation or condensation control ***depending on the length (015= 1.5 m, 030= 3 m, 060=6 m)	NTC***WP00
Pressure probes for condensing pressure control ** depending on the pressure (13= 150 PSI, 23= 75 PSI, 33= 500 PSI)	SPK*R*
Connectors kit for code MCH2000001 (multiple package 20 pcs)	MCH2CON001
Connectors kit for code MCH2000001 (multiple package 10 pcs)	MCH2CON021
Minifit connectors kit + 1 meter length for code MCH2**	MCHSMLCAB0
Minifit connectors kit + 2 meter length for code MCH2**	MCHSMLCAB2
Minifit connectors kit + 3 meter length for code MCH2**	MCHSMLCAB3
Remote terminal for MCH20000** for panel installation MCH200TP0*	MCH200TP0*
Remote terminal for MCH20000** for wall-mounting MCH200TW0*	MCH200TW0*
Supervisor serial connection kit for remote terminal	MCH200TSV0
Fan speed PWM 4 A/230 Vac	MCHRTF04C0
Fan speed PWM 8 A/230 Vac	MCHRTF08C0
Fan speed PWM 12 A/230 Vac	MCHRTF12C0
Fan speed PWM 10 A/230 Vac 1 Pc. Nor. Ind.	MCHRTF10C0
Fan speed PWM 10 A/230 Vac 10 Pc. Nor. Ind.	MCHRTF10C1

Table 9.a

10. TECHNICAL SPECIFICATIONS AND SOFTWARE UPDATES

10.1 Technical specifications

Electrical specifications

In the following specifications "Group A" defines the grouping of the following outputs: valve, pump, compressor, heater.

Power supply	24 Vac, range +10/–15 %; 50/60 Hz
	Maximum power input: 3W
	Fuse (compulsory) in series with the power supply to the µC²SE: 315mAT
12 pin connector	Max. current 2 A for each relay output, extendable to 3 A for one single output
Relays	Max current at 250 Vac: EN60730: resistive: 3A, Inductive: 2A cosφ =0.4 60,000 cycles UL: Resistive: 3A, 1 FLA, 6 LRA cosφ =0.4 30,000 cycles
	For further information refer to the characteristics shown in Figure 10.a
	Minimum interval between communications (each relay): 12 s (the manufacturer of the unit that the device is integrated into must ensure the correct configuration so as to respond to this specification
	Type of microswitching: 1 C
	Insulation between relays in group A: functional
	Insulation between the relays in group A and the very low voltage parts: reinforced
	Insulation between relays in group A and the signal relays: primary
	Insulation between the signal relays and the very low voltage parts: reinforced
	Insulation between the relays and the front panel: reinforced
Digital inputs	Electrical standard: voltage-free contacts
	Closing current to earth: 5 mA
	Maximum closing resistance: 50 W
Analogue inputs	B1, B2, B3, B4: NTC CAREL temperature probes (10 kW at 25 °C)
	The response time depends on the component used, typical value 90 s
	B4: NTC temp. probes (10 kW at 25 °C) or CAREL 0 to 5 V ratiometric pressure probes SPKT00**R*
Fan output	Control signal for CAREL modules MCHRTF****, CONVONOFF* and CONV0/10A*
	Phase width modulation (settable width) or modulation of the duty cycle
	No-load voltage: 5V ± 10%
	Short-circuit current: 30 mA
	Minimum output load: 1 kW
Front panel index of protection	IP55
Storage conditions	-10T70 °C – humidity 80 % rH non-condensing
Operating conditions	-10T55 °C – humidity <90 % rH non-condensing
Degree of pollution	Normal
Cat. of resist. to heat and fire	D (RU94 V0)
PTI of the insulating materials	All the insulating materials have PTI≥250 V
Software class and structure	A
Period of electric stress across insulating parts	Long
Homologations	CE/RU (File EI98839 sez.16)

Table10.a

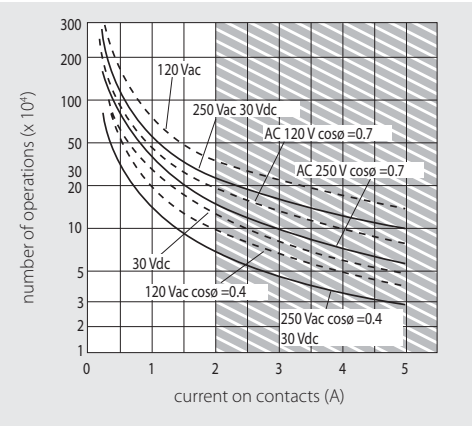


Fig. 10.a

Nota: all the relays must have the common terminals (C1/2, C3/4, C6/7, C8/9) connected together.

Functional characteristics

Resolution of the analogue inputs	Temperature probes: range -40T80 °C, 0.1 °C
Temperature measurement error	Range -20T20 °C, ±0.5 °C (excluding probe)
	Range -40T80 °C, ±1.5 °C (excluding probe)
Pressure measurement error	The % error with a voltage reading with a range of input from 0.5 to 4.5 is ± 2% (excluding probe).
	The error in the converted value may vary according to the settings of parameters /9, /10, /11, /12

Table 10.b

Characteristics of the connectors

The connectors may be purchased using CAREL code (MCHCON0***) or from the manufacturer Molex®

Molex® codes of the connector	Number of pins
39-01-2120	12
39-01-2140	14

Table 10.c

Max. number of insertion/removal cycles for the connectors: 25 cycles

Code of the contacts according to the cross-section of the connection cables to the 12- and 14-pin connectors (use the special Molex® tool code 69008-0724 for crimping

Molex® code of the contact	Cross-section of cables allowed
39-00-0077	AWG16 (1.308 mm^2)
39-00-0038	AWG18-24 (0.823 to 0.205 mm^2)
39-00-0046	AWG22-28 (0.324 to 0.081 mm^2)

Table 10.d

In addition, the pre-wired kits MCHSMLC*** are also available

WARNINGS

- If one transformer is used to supply both the µC²SE and the accessories, all the G0 terminals on the various controllers or the various boards must be connected to the same terminal on the secondary, and all the G terminals to the other terminal on the secondary, so as to avoid damaging the instrument;
- For use in residential environments, use shielded cable (two wires + shield earthed at both ends, AWG 20-22) for the tLAN connections (EN 55014-1).
- Avoid short-circuits between V+ and GND so as to not damage the instrument;
- Perform all the maintenance and installation operations when the unit is not connected to the power supply;
- Separate the power cables (relay outputs) from the cables corresponding to the probes, digital inputs and serial line;
- Use a transformer dedicated exclusively to the electronic controllers for the power supply.

Protection against electric shock and maintenance warnings

The system made up of the control board (MCH200003*) and the other optional boards (MCH200002*, MCH200485*, MCHRTF****, CONVONOFF*, CONV0/10A*, EVD000040*) represents a control device to be integrated into class 1 or class 2 appliances.
The class of protection against electric shock depends on how the control device is integrated into the unit built by the manufacturer.
Disconnect power before working on the board during assembly, maintenance and replacement.
The protection against short circuits must be guaranteed by the manufacturer of the appliance that the controller will be fitted on.

Maximum length of the NTC/ratiometric probe

NTC/ratiometric probe connection cables	10 m
digital input connection cables	10 m
power output connection cables	5 m
fan control output connection cables	5 m
power cables	3 m

Table 10.e

10.2 Software updates

10.2.1 Notes for version 1.1

First release.

10.2.2 Notes for version 1.2

Optimised use of the programming key.

10.2.3 Notes for version 1.3

Implemented direct current operation.
Use EXP. version 1.5 or higher.

10.2.4 Notes for version 1.4

Implemented a differential relating to the working set point for electric heaters in air- and water-source units. Implemented cooling only air-source unit with electrical heaters operating in heating mode only.
Implemented new logic for the activation of the alarm relays.
Implemented new logic for the management of the high pressure alarm.
Implemented management of minimum damper opening.
Implemented damper inactivity time in freecooling or freeheating mode.
Optimised management of damper closing for minimum outlet temperature limit.
Implemented alarm reset from µAD.

10.2.5 Notes for version 1.6

Improved Modbus® communication with supervisory system

10.2.6 Notes for version 1.7
Implemented second antifreeze set point (A14)

10.2.7 Notes for version 1.8
Improved broadcast of Modbus® communication with supervisory system

10.2.8 Notes for version 1.9
Improved DO management with DC power supply

10.2.9 Notes for version 2.0
- Implemented the option to connect µC2SE, expansion board and one EVD400 which increases the number of I/Os available even in single circuit applications.
- Increased the options for the parameters (P25~P32) corresponding to the digital output settings (function also available for the outputs on the expansion if the firmware version on the latter is 1.7 or higher).
- Implemented a new type of alarm (CP1~CP4), relating to the individual compressors.
- Implemented a settable delay time (C19) between pre-opening of the electronic expansion valve (by EVD400) and compressor start.

10.2.10 Notes for version 2.1
Improved the set point compensation algorithm for the supplementary heater in heat pump mode.

10.2.11 Notes for version 2.2
Improved integration with the µAD room terminal in heating and cooling modes

CAREL reserves the right to modify the features of its products without prior notice

CAREL

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